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Quantitative Analysis to Further Validate WC-GCMS, a Computational Metric of Collaboration in Online Textual Discourse

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Abstract

Online learning has become one of the main ways to receive education nowadays. In order to provide a more efficient and interactive form of online learning it is essential to create a more social learning environment. One of the ways to provide such care is using tactics such as “face-to-face” (F2F) or in-person. When activities used in person are used during online learning, it can help to create a similar feeling one would have in a real classroom. This article explains that Social Coherence (SC) is limited through textual discourse and is not as effective through online learning since there is a barrier through the screen that disables physical touch. Therefore, an equation was modeled to display the levels of social coherence depending on the group size, the level of contribution between each member, and interaction. The Word-Count/Gini-Coefficient Measure of Symmetry (WC-GCMS) is a metric system that helps instantly tell the level of collaboration in online discussions. Social Coherence (SC) also allows us to validate collaboration; however, WC-GCMS is thoughtful of SC making it a powerful metric.

Key Words: Social Coherence, Textual Discourse, Collaboration, WC-GCMS

1. Introduction

Throughout the ages, social interaction has been ingrained in our nature. Communication, socialization, and physical touch have been vital for our progress and development. Face-to-face (F2F) interaction is not only crucial for productivity and coherence, but it also fosters physical touch, which plays a significant role in enhancing our memory, promoting mental well-being, increasing happiness, and potentially contributing to human longevity. The National Institute of Health explains that nonsensuous touching can cause a variety of benefits for our health. Not only does it release a natural bonding hormone, oxytocin, but also neurological changes affected in the brain when humans touch can increase confidence, decrease anxiety, and enhance our immune system. Physical touch plays a significant factor in coherence because it displays a sense of empathy and deep emotional connections between individuals.

The Word-Count/Gini-Coefficient Measure of Symmetry (WC-GCMS) is a metric system that helps to instantly tell the level of collaboration taking place in online discussion. Social Coherence (SC) also allows us to validate collaboration, however, WC-GCMS is thoughtful of SC making it a powerful metric. This article explains that Social Coherence (SC) is limited through textual discourse and is not as effective through online learning since there is a barrier through the screen that disables physical touch. Therefore, an equation was modeled to display the levels of social coherence depending on the group size, the level of contribution between each member, and interaction. It is easier to assess and regulate coherency with F2F group learners where verbal and visual cues are conveyed. Texting lacks the social coherence levels met in a F2F interaction. As the study shows, social coherence is more prominent when communication is through visual or verbal means. As mentioned in the article, the timing in a text-based and online environment can distort coherency and the contribution sequence.

2. Face-to-Face Interaction (F2F)

It is crucial to have an instructor oversee and assist students in order to facilitate effective collaboration among groups. Team projects are typically better organized when conducted face-to-face (F2F) with the guidance of a teacher. On the other hand, with online classes teachers have to rely on breakout rooms in platforms like Zoom to facilitate group discussions. Unfortunately, this approach proved to be less efficient and challenging for student collaboration as it lacks the direct aid of an instructor.

Face-to-face interactions are crucial to social activity and behavior. It helps us understand situations better, digest information more efficiently, and helps us communicate easily. It is understood that it is more common for students to be lost, not comprehend the lesson, & not understand an assignment in online classes. Face-to-face classes provide more motivation to a student and opportunities to act in a more professional setting, developing their own communal skills. Physical interactions allow a teacher to engage with a student and get a better grasp of how their students work and behave.

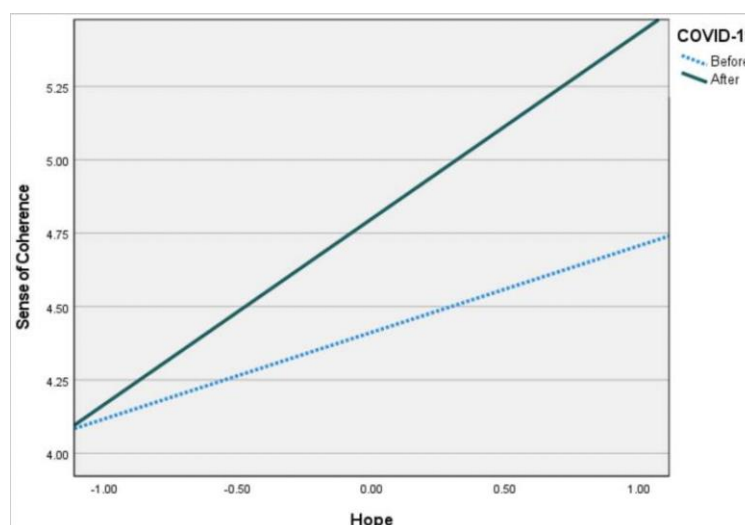


Figure 1

Social Coherence before and after the Covid 19 pandemic

Source: National Health Institute of Science

Reduction of human interaction, however, affects the motivation students have, which can even lead to increased procrastination and lack of care for the class. The lessons should give attention to what students normally enjoy in order for them to keep learning efficiently. In order to make online classes have a similar feel to physical ones, we can incorporate WC-GCMS to increase student interaction. There are other tactics we can use, for example, teachers having one on one meetings with students so they can make sure that although everything is taught online they have a clear understanding of the lesson.

3. Enhancing Online Learning Engagement

Maintaining student engagement in virtual classrooms is challenging due to the lack of physical presence and limited social interactions. However, fostering active engagement is crucial for effective online learning. Engaged students participate more, retain information better, and develop a deeper understanding.

Strategies like gamification, interactive quizzes, and virtual simulations can enhance online learning engagement. Gamification uses game elements to make learning interactive and enjoyable. Interactive quizzes provide immediate feedback, while virtual simulations offer hands-on experiences. These approaches have shown positive impacts, such as increased participation, higher completion rates, and improved learning outcomes.

Artificial intelligence (AI) can be used to enhance online learning engagement in a number of ways. AI can personalize the learning experience, provide customized support, gamify the learning experience, and analyze student data. By providing personalized support, gamifying the learning experience, and analyzing student data, AI can help to keep students engaged and motivated, and ultimately improve their learning outcomes.

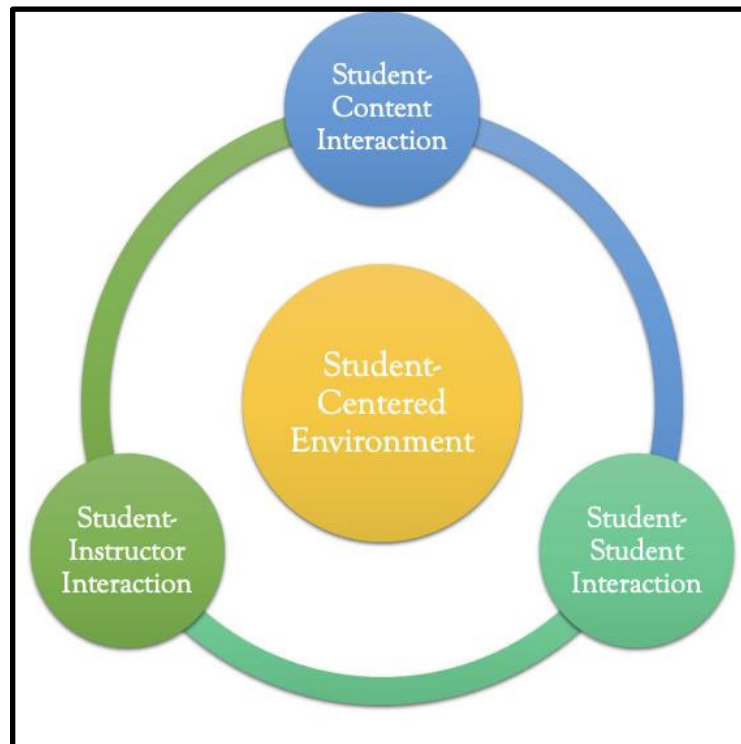


Figure 2

4. Online Community Engagement

Keeping student engagement in virtual classrooms is challenging. AI intelligence can be used to enhance online learning engagement by personalizing the learning experience, providing customized support, gamifying the learning experience, and analyzing student data.

For example, AI can create personalized learning paths for each student, provide real-time feedback, and gamify the learning experience. This would help to keep students engaged and motivated, and ultimately improve their learning outcomes.

Overall, AI intelligence has the potential to revolutionize online learning by making it more personalized, engaging, and effective.

This study aims to bridge the gap between the social awareness experienced by face-to-face and online group learners. Students can enhance their social cognition and collaborative skills by helping teachers envision and create an interactive classroom environment that fosters stronger social connections.

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Using Explainable Machine Learning to Automatically Provide Feedback to Students Based on Data Analysis

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Abstract

Providing feedback to students is one of the most powerful practices that have enhanced education in the world today. Despite there being useful feedback provided by students' self-regulation and teachers' feedback provision, there is still a need for feedback that provides meaningful insights or actionable information about the reasons behind it, which is not provided by the said feedback. This paper explores how we can use explainable machine learning to compute data-driven feedback concerning students' academic performance and generate actionable recommendations which are beneficial for students and teachers. This method has been developed based on LMS (Learning Management System) data from a university course. The effectiveness of the proposed approach has been evaluated with the results demonstrating 90% accuracy.

Key words: Explainable Machine Learning, Learning Management System

Introduction

The traditional educational paradigm often struggles to provide timely and personalized feedback to students, limiting their learning progression. The emergence of machine learning as a tool to analyze large datasets and extract patterns has opened up new possibilities for automating the feedback process. This paper examines the ways in which machine learning can enhance the quality and efficiency of feedback mechanisms in educational settings. In addition, this paper seeks to answer the following questions:

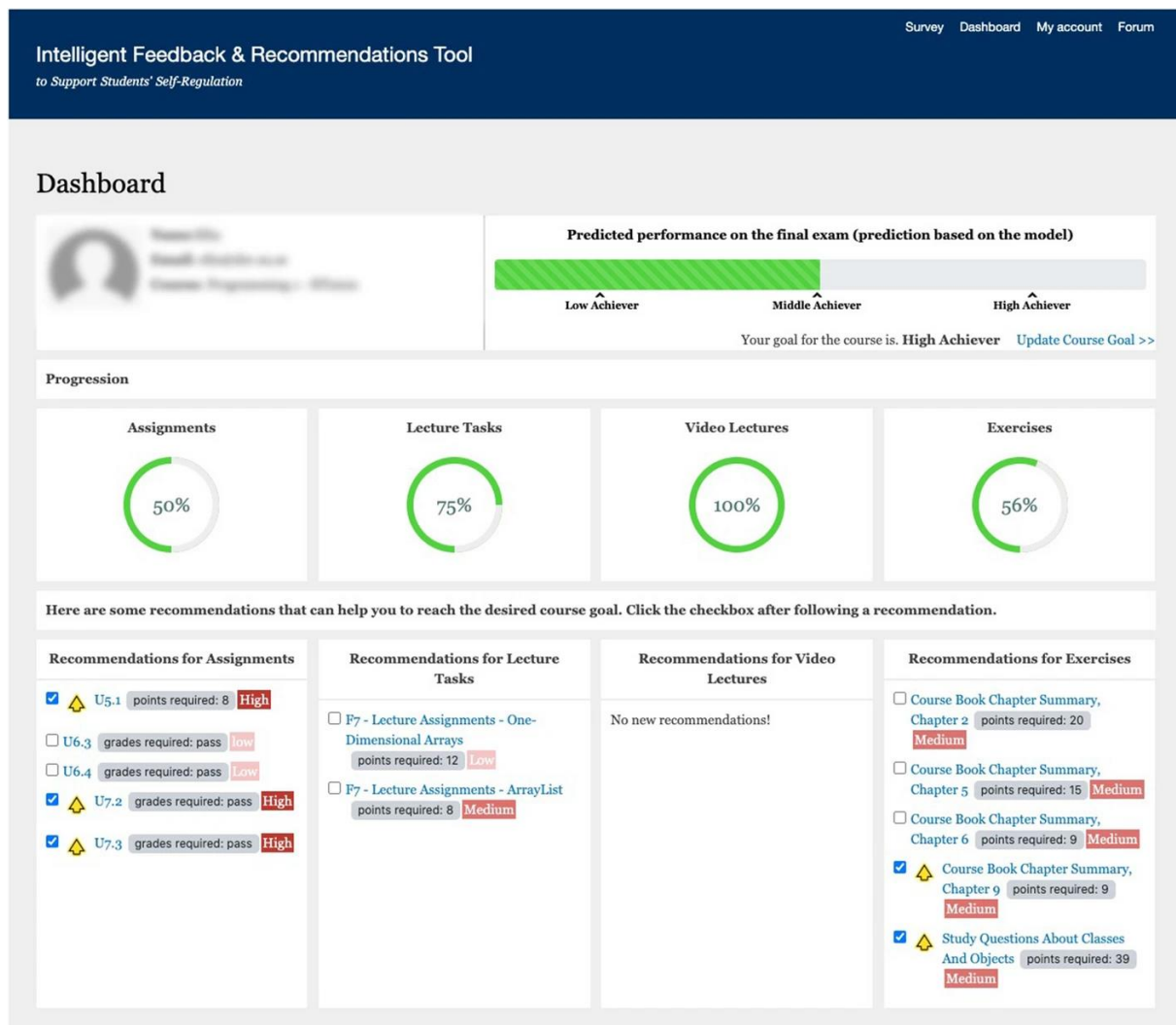
- How can explainable machine learning approaches be leveraged to provide effective and human-understandable reasoning behind conclusions about a student's academic performance?
- How can automatic data-driven feedback and actionable recommendations be derived?

Methodology

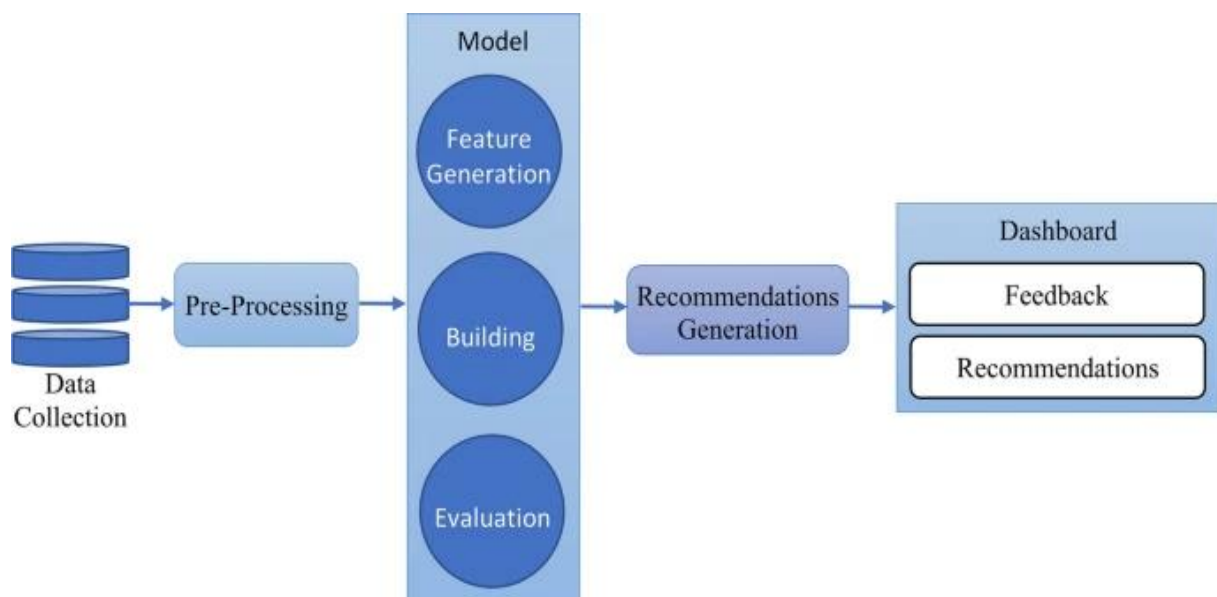
The proposed approach combines learning analytics techniques with explainable machine learning to provide automatic and intelligent feedback to students based on data analysis. The method includes the following steps:

1. Data collection: Gathering relevant data from a university course, such as student performance, behavior, and engagement. The student data is gathered from a learning management system and is used to train the artificial intelligence models. Cleaning and preprocessing of the data is done to ensure its quality and consistency.
2. Predictive modeling: Using machine learning algorithms to predict students' performance based on the collected data. The following predictive modeling techniques can be used:
 - Linear regression: This technique predicts a continuous outcome variable based on one or more independent variables.
 - Logistic regression: This technique predicts a binary outcome variable (e.g., yes/no, pass/fail) based on one or more independent variables.
 - Decision trees: This technique predicts an outcome variable by creating a tree-like structure that shows the relationship between the independent variables and the outcome variable.
 - Support vector machines: This technique predicts an outcome variable by finding the hyperplane that best separates the data into two classes.
 - Neural networks: This technique is a more complex technique that can learn non-linear relationships between the independent variables and the outcome variable.
3. Explainability: Providing transparency and human-understandable reasoning behind the predictions to help students understand their performance and identify areas for improvement. This can be done by developing methods to explain the root causes of the predictions. Such methods include:

- Feature importance: This technique shows which features of the data are most important for the predictions of a model. This can be done by calculating the weight that each feature is given in the model, or by using a statistical test to measure the significance of each feature.
 - SHAP values: This technique provides a more detailed explanation of the predictions of a model by showing how each feature contributes to the prediction. This can be done by calculating the Shapley values for each feature, which measure the contribution of each feature to the model's output.
 - LIME(Local Interpretable Model-agnostic Explanations): This technique explains the predictions of a model by generating a local linear approximation of the model around the data point being explained. This can be done by creating a simplified model that only uses the features that are most important for the prediction.
 - Partial dependence plots: These plots show how the predictions of a model change as a single feature is varied. This can be done by plotting the predictions of the model for different values of the feature.
4. Actionable recommendations: Deriving data-driven recommendations for action based on the predictions and explanations. Providing personalized feedback that is tailored to each student's needs and performance.
5. Dashboard development: Creating a dashboard that presents the feedback and recommendations to students in an accessible and user-friendly manner. The dashboard can display information such as assignments covered or to be done and exercise recommendations which the student can attempt to improve scores. The following is a sample dashboard.



6. Testing and evaluation: Assessing the effectiveness and usability of the approach through testing and evaluation with students. Collecting feedback from students to improve the approach and the dashboard.



Benefits of using explainable machine learning for feedback

Machine learning algorithms bring several advantages to the feedback process in education. They can process a vast amount of student-generated data, enabling the identification of individual learning patterns and preferences. This personalization enhances the relevance and effectiveness of feedback, leading to improved learning outcomes. Additionally, automation reduces the burden on educators, allowing them to allocate more time to teaching and mentoring.

Challenges and considerations

Despite the potential benefits, integrating machine learning into educational feedback systems presents challenges. Ensuring the accuracy and fairness of feedback generated by algorithms is crucial. Biases within training data can lead to skewed results, disproportionately affecting certain groups of students. Striking a balance between automation and human oversight is essential to maintain the educational value of feedback.

Future directions

The field of automated feedback using machine learning is rapidly evolving. Future research could focus on refining algorithms to better understand context and nuance in students' work, thereby improving the quality of feedback. Additionally, investigating hybrid models that combine machine-generated feedback with human insights could leverage the strengths of both approaches.

Conclusion

This research paper presents an approach that utilizes explainable machine learning and learning analytics techniques to automatically provide feedback and actionable recommendations to students based on data analysis. By combining predictive modeling, explainability, and actionable recommendations, the approach aims to support students' self-regulation and improve their performance in courses. The developed dashboard serves as a platform for delivering the feedback and recommendations in a user-friendly manner. Further testing and evaluation are needed to assess the effectiveness and usability of the approach.

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Building Resilience

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Abstract

Resilience is important for our wellbeing. In order to address systemic problems like homelessness we must understand how systems function and identify the various factors that contribute to building resilience such as physical wellbeing, supportive community, and purpose. Research, philosophy, and sources of ancient wisdom can all be relevant sources for building resilience.

Keywords: resilience, systems, complex-PTSD, reductionism, Ecclesiastes

1. Introduction

Let me begin with a personal story about my Great Uncle Dan. When he was 13 years old, he accidentally discharged his rifle and the bullet ricocheted, striking his arm. By the time a doctor could be summoned to their remote ranch, it was necessary for the arm to be amputated—on the kitchen table.

After he grew up, one of his friends said that he could do more with one arm than many men with two. When a passerby got stuck in a ditch, he sent a son to fetch my great uncle. Upon returning the boy told his father he had no reason to complain about having 13 children: the man coming to pull them out had more children and only one arm. Actually, many of the children were boarding there so that they could have a school.

This is the type of resilience that gets people through tough times like pandemics. It is resilience which we hope to develop in the homeless that our new university (American Theological University) will be serving.

Resilience is defined as the ability of a system to return to normal functioning after a severe disruption. In order for a system to return to normal functioning there need to be stocks and flows that restore normal throughput (Meadows, 2008, p. 17). In complex systems, such as humans in society, the multiple interactions can make it difficult to identify where to intervene to restore optimal performance. Early research on the complex behavior of systems was done by Jay Forrester (1995).

Our Research Program

In order to better understand the systems that affect the homeless we are collecting qualitative data from interviews with the homeless. One theme that has appeared in preliminary research is abusive situations as children which leads to what has been termed Complex-PTSD (Resick et al., 2012). This is partly the result of prolonged stress (Szabo et al., 2012). In systems terms these adults have been unable to develop normal stocks and feedback loops. Often they have developed addictions which temporarily alleviate pain, but create a feedback loop that causes dysfunction in terms of employment and the ability to handle normal, everyday responsibilities.

A Philosophical Obstacle to Proper Systems Analysis

At this point, it would be useful to note that a methodological problem affects attempts to determine the root cause of homelessness among other issues. Much of the success of modern science may be due to reductionism (van Riel & Van Gulick, 2019). However, certain systems, especially those that rely on a set of symbols, such as language, cannot be explained by reference to the physical structures associated with them. The information bearing system resists reduction past a certain point. On the other hand, trauma to the physical system can

affect the operation of the higher-level information system. Such ambiguities and interdependencies make root cause analysis difficult.

Meaning as a Component of Resilience

In looking at the literature on resilience, the experience of concentration camp survivors is noteworthy, particularly the observations of the psychiatrist Viktor Frankl (1992). Frankl survived by focusing on his hope for a reunion with his wife and the possibility of once again teaching; thus, finding purpose and meaning. Hope is a powerful source of resilience.

Points of Intervention

What we have been aiming for is a non-reductivist analysis of the various interlocking systems where one needs to establish proper stocks and flows. At the organic level, proper rest and nutrition are necessary. Maintaining the integrity of our genetic material against mutation is a factor. At the psychological level one needs to restore levels of trust and love with significant others in community to be resilient. Finally, a sense of purpose and hope needs to be developed. This requires a functional social organization that provides security and belonging. Ultimately, there is a need for a resilient ecosystem, but this is beyond the scope of our planning.

Ancient Wisdom

The problem of resilience is not new, and I have gained much insight from reading and reflecting on the ideas in the book of Ecclesiastes. We see the theme of purpose. We see the need for a relationship with the Creator whose commands enable us to be resilient. We see the idea of homeostasis or balance: do not be overly wise, but do not be a fool (Eccl. 7: 16-17). Rhythm, a word preferred by Stephen Smith (2020), who promotes soul care, is a key part of building resilience. Finally, Ecclesiastes reminds us of the value of community: “a cord of three strands is not easily broken” (Eccl. 4: 12).

May you form cords of resilience by finding rhythm, purpose, and community!

Now all has been heard;

here is the conclusion of the matter:

Fear God and keep his commandments,

for this is the duty of all mankind. (Ecclesiastes 12: 13)

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Design Thinking: Best way to supply chain's success?

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Abstract

Creativity is the key for successful businesses and supply chains to bring new ideas and solutions to the surface. Design thinking (DT) practitioners rely on creativity to achieve sustainable competitive advantages and the ability to innovate. How promising is this approach in practice? Could it lead to more success for companies and supply chains? Can it be recommended for any business, supply chain, or industry? Why should the application of design thinking be supported, and who should take responsibility for DT projects? These and other questions build the investigation for the actual question: whether DT is the best way for supply chain success. The analysis of the open-ended questionnaires involving experts and practitioners in the field of DT shows a diverse understanding of what DT is or who is responsible for it. However, everyone should agree that creativity, regardless of its corresponding approach, is always worthwhile.

Keywords: strategy for innovation, creativity for supply chains, problem-solving approach

1. Introduction

The market is full of unwanted products and services, highlighting a discrepancy between what product creators think the market needs and what customers need (Vermeulen, 2019). Studies conducted in the USA and the Netherlands show that 70-80% and 39% of innovations fail in whole or in part respectively (Cozijnsen et al., 2000). In this context, complex systems are one of the main reasons for operational failures (Cook, 1998). Unfortunately, almost everything is complex in the organizational context nowadays: products, processes, projects, and groups. This explains why organizations and supply chain systems should reconsider all tools and systems they employ to avoid operational failures.

In this regard, Design Thinking (DT) emerges as one of the potential solutions to the problematic situation. DT practitioners particularly emphasize its capacity to enhance the understanding of stakeholders and their interests or break down complex issues into clear ones. Consequently, the DT market is experiencing strong growth and is expected to grow further in the upcoming years. It has increased its importance in various industries, including technology, healthcare, finance, and education (MarkWide Research, 2023).

This paper explores whether or not DT is a worthwhile approach for supply chains to deal with the possibilities that arise from its adoption in organizations and supply chains. DT experts and practitioners worldwide responded to open-ended questions about the purpose of DT, key DT tools, requirements for successful DT projects, or advantages that could result from its use in supply chains.

Despite the high diversity in research participants' responses, it is clear that they share a positive perspective on creative approaches. This paper is structured as follows: after a literature review in Chapter 2, Chapter 3 presents the research method, followed by a practical example of a concrete supply chain in Chapter 4. Chapter 5 presents three selected case summaries, while Chapter 6 outlines this study's summary and conclusions.

2. Literature Review

Design Thinking (DT) is a common approach as organizations and industries of all sizes have applied it. However, different understandings circulate about what DT is. DT definition ranges from toolbox, process, method(ology), or mindset. True to the motto "the sum is greater than the individual parts", proponents of DT point out that DT's advantages will only emerge through the interaction of individual mindsets, principles, practices, and tools (Schmiedgen et al., 2015).

DT might help in **understanding** problems and designing superior solutions. Problems often arise from a stakeholder context. DT enables companies to empathize with users and buyers (Cankurtara et al., 2020). It is an empathetic approach that makes it possible to understand the actual context of a situation by identifying users' needs, desires, motivations, pain points, and frustrations. In other words, the approach might help companies to understand their users' point of view (Groupe de recherche Littoral et vie, 2019).

DT facilitates new ideas and innovations to emerge, sometimes merely through simple questions such as, "What if the product had a different shape?" (Cankurtara et al., 2020). DT

promotes success by implementing the trial-and-error principle, since “the secret of success is making mistakes faster than anybody else”. The secret here is to create early and frequent modeling and simulation to minimize each mistake's consequences while facilitating the organization's learning capacity. This approach is the opposite of traditional business thinking which focuses on avoiding mistakes at all costs (Lockwood, 2010). Design thinkers do not expect a perfect instant solution as they acknowledge that further reworking and improving the idea would bring them closer to an ideal customer solution, creating iterative loops. The user-centered approach processes customer feedback throughout the process. The openness to all possibilities accommodates ingenious ideas and solutions (Groupe de recherche Littoral et vie, 2019). Design thinkers should be involved early in the innovation process to promote the notion that DT facilitates innovations. That said, they should perform human-centered DT to reveal unexpected insights, make sure that design thinkers are available during the whole DT process from Inspiration, Ideation to Implementation, and adjust the budget to the pace of innovation (Brown, 2008).

DT promotes the potential for a sustainable business model innovation as it invites previously unnoticed stakeholders to the value proposition (e.g. mapping and understanding the stakeholders and identifying their needs and interests, harmonizing the often-conflicting stakeholder interests) (Kurek et al., 2023). INDEX, for example, uses DT to save the environment by inventing a system to remove plastic waste from the oceans: the Ocean Cleanup (Groupe de recherche Littoral et vie, 2019). There is a trend that organizations are increasingly using as they seek to emphasize sustainability, address environmental and social challenges, and design sustainable solutions. Key areas such an application include circular economy initiatives, sustainable product design, and social impact projects (MarkWide Research, 2023).

The SWOT analysis shown in figure 1 also adds strengths, weaknesses, and threats to the opportunities (MarkWide Research, 2023).

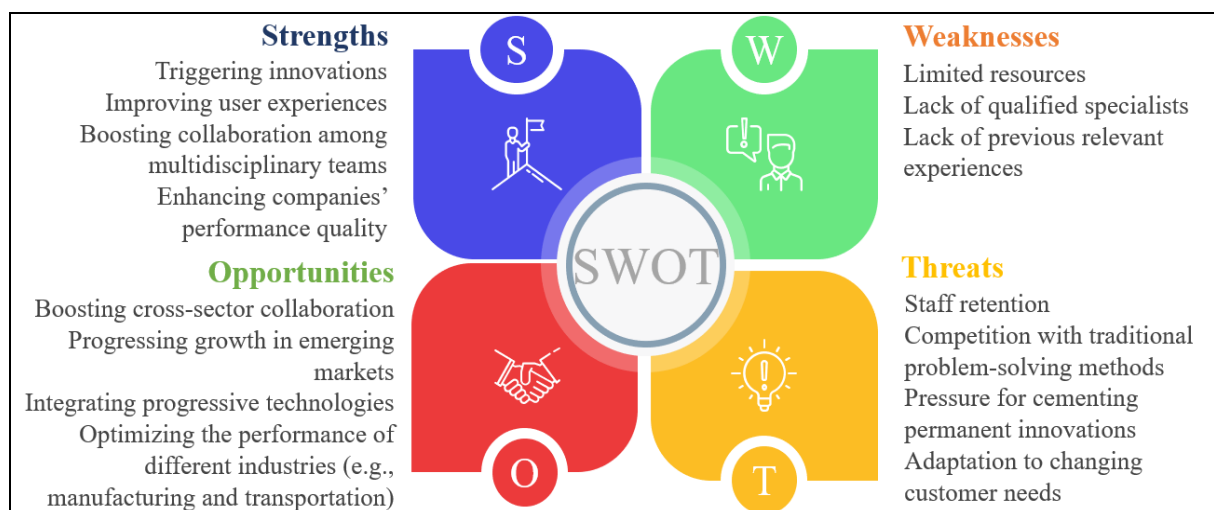


Figure 1: SWOT-Analysis DT-Market

Source: own representation following MarkWide Research, 2023; slide template from Slidesgo and Freepik

DT can best be explained as a system of spaces: **Inspiration** (e.g. starting with an opportunity or problem), **Ideation** (generating, developing, and testing ideas to obtain solutions), and **Implementation** (e.g. putting solutions into practice). These spaces construct the continuum of innovation (Brown, 2008). The following section presents a few DT tools in more detail (Liedtka et al., 2017; Yayici, 2016). Simple **brainstorming** (see figure 2) is just as much a part of the DT approach as journey mapping or rapid prototyping.



Figure 2: Brainstorming

Source: ulrichw, pixabay.com

On the one hand, there is visualization that addresses other parts of the brain and does not just use words or language. In **mind mapping**, users can elaborate sub-themes and topics around a central idea, or a keyword put in the map's center, and test possible connections that these elements have with each other. **Personas**, which are fictional characters that help to imagine the target groups, should be described using a photo, name, and demographic information such as age, gender, and occupation. **“How-might-we” questions** support the DT team to make the design challenge more concrete. For example, the question, “How might we improve customer satisfaction in our restaurant at the lunch buffet?” helps design thinkers map customers' current experiences and any gap between those and idealized experiences. In this context, **journey mapping** is about observing the customer's experiences at different touch points as he or she interacts with the organization, to find out what the customer needs to improve the customer experience. **Value chain analysis** focuses on analyzing the interactions between companies and their value chain partners to optimize their collaboration's value by working backward from supplier to company to distribution to customer. **(Rapid) Prototyping** is about making abstract new ideas and tangible concepts tangible for potential users to ignite user involvement and receive early user feedback. It enables the DT team to learn quickly from failures (Liedtka et al., 2017; Yayici, 2016).

3. Research method

After a comprehensive literature research was carried out, which shows both possible advantages and criticism of Design Thinking (DT), a DT example of a concrete supply chain is shown. The example shows the steps that are run through in the DT process as well as possible DT tools that can be used. Above all, however, it allows a first critical examination of the DT approach using a concrete example. An **open-ended questionnaire**, which contains 17 questions, provides the basis for the so-called case summaries - i.e. brief summaries of, in this case, 3 selected questionnaires, which, together with the entire portfolio of answers in the background, form an excellent basis for discussion and allow initial answers to be given, whether DT is advisable for companies and supply chains, and if so, under what conditions.

4. Practical example: supply chain in concrete construction

The supply chains of construction projects are enormously complex (Deutscher Beton- und Bautechnik-Verein E.V., n.d.). Such projects require a wide variety of construction materials. Consequently, construction companies must deal with numerous bills of delivery from different projects as they collaborate with different suppliers, creating potential supply chain chaos. That situation supports the notion that these companies should digitize and standardize their supply chain systems using the example of ready-mixed concrete. Figure 3 shows a schematic representation of a **concrete supply chain**. In this context, the construction company orders concrete from the manufacturer while communicating the desired requirements. When the concrete is delivered, the supplier gives the contractor a delivery note (often a mere analog paper).

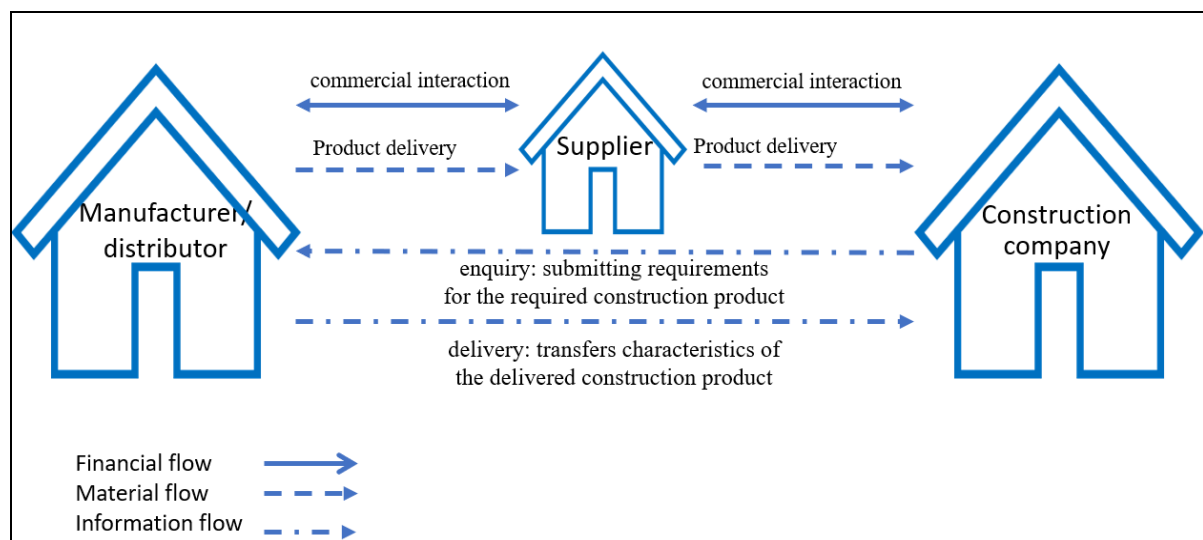


Figure 2: schematic representation of a concrete supply chain

Source: own representation following Deutscher Beton- und Bautechnik-Verein E.V. (n.d.)

It is challenging for construction companies to check delivery notes manually to ensure that they receive the desired amount of materials with the desired quality. That said, digitizing this process would involve transforming manual data into digital format to eliminate possible human errors since the digital system will recognize every information contained in each note automatically, saving much time and energy. Some steps are necessary for initiating such transformation, with the DT approach having the potential to be exercised (Deutscher Beton- und Bautechnik-Verein E.V., n.d.).

- problem definition based on specific user needs
 - determining the current status of the solution
 - carrying out a market analysis
 - working out challenges
- determination of requirements
 - developing personas to understand who the users are
 - adjusting the personas using expert interviews and on-site observations
 - forming hypotheses about the personas (e.g. users are afraid of change or to learn something new)
 - repeatedly checking hypotheses until reality is represented as best as possible
 - the established hypotheses by means of the expert interviews

either falsified or confirmed and the problem definition can be adapted again if necessary

 - the **focus is on customer** and user feedback
- idea generation
 - using methods such as Mind-Mapping, 6-3-5 method or SCAMPER-method (Substitute – Combine – Adapt – Magnify – Put – Eliminate – Rearrange/Reverse)
 - ideas are collected and compiled (not evaluated)
 - evaluation of ideas (e.g. based on profitability or feasibility)
 - idea prioritization
- prototype development of a digital application
 - development of the necessary structure, steps, functionalities
 - as well as the design of the prototype developed
 - development of a mock-up or a demonstration model
 - the level of detail and the design of the application

will be increased step by step according to the received user feedback

 - development of a working model of the application
- testing phase
 - creation of a test plan (description of the test scenario, how many people should be tested ..)
 - using the Thinking-Aloud method to test applications where the users express their thoughts and actions aloud while testing and using the application, so that the developers can get even more understanding
 - using the Heatmap or Clickmap to visualize how often, how long and on which areas in the prototype the test person stays with the mouse pointer
 - testing with users to collect feedback and get answers as to whether the concept works

- testing the prototypes for a set period of time under real conditions by users and document the experiences

Sample analysis with critical assessment

It is expected that the “supply chain in concrete construction” example provides insight into how one could imagine DT in a supply chain. Since DT promotes **critical thinking**, this study conducted a brief critical assessment. The starting point of the example is a concrete problem, such as the chaos with the numerous different paper delivery notes. A question may emerge from the situation; What if an idea is the starting point that initiates the DT process?

The example does not specifically show who is responsible for DT or who initiates the process, leading to two probabilities. On the one hand, it suggests that the idea generation can happen anywhere. All it takes is an individual who believes the world could be better in some aspects, creating the trigger for creativity. Therefore, the initiator of the DT process may be anyone involved in any activity anywhere on the supply chain at any level. This condition may serve as an ideal encouragement for local factory workers with no authority to communicate their creative ideas to higher authorities. This condition outlined two things that DT practitioners need to initiate the process: a brilliant idea and how to communicate the idea (D. Sherwood, telephone conversation, August 28th, 2023).

The example also gives the impression that DT begins with a problem that needs to be solved. Problem statement is a feature of DT because problems draw solutions. However, creativity may transcend the problem-solution relationship since it represents the aspiration to improve existing procedures. In this context, disruptive innovations may be problematic to those who are unable to catch up and those who have waited for such innovations for too long, suggesting that the problem statement of a DT approach should be comprehensive enough to entail any opportunity for improvement to existing conditions (D. Sherwood, telephone conversation, August 28th, 2023).

5. Case Summaries

Case summaries are individual, case-by-case summaries of interviews or questionnaires. These summaries offer an excellent basis for further discussions as they present cases briefly and concisely. A short title that represents each interviewee's background and characteristics is given to each person interviewed (Rädiker & Stefer 2007). Three cases were randomly selected. They highlighted diverse opinions and standpoints on the subject of DT. There were 11 completed, highly extensive open-ended questionnaires with 17 questions, which already provide an adequate basis for discussion. It should be noted that these are interim results and that the research should, if not must be, continued.

Case summary of person 1

The experienced programmer who thinks that "design is everything."

- Top programmer - with 35 years of experience in the design of aerospace parts and consumer products
- For him/her DT helps ensure that the design satisfies the need of the initial requirements.
- Has been dealing with DT for 35 years.
- Thinks that the key skills a DT specialist should have is experience and manufacturing.
- Believes that the purpose of DT is practically only for thoughtful design.
- Mentions use of research, usability, testing, interviews, prototypes as the key DT tools.
- Has never been involved in failing DT projects.
- Thinks that leadership is one of the requirements for successful DT projects.
- In his/her opinion Happy employees is how the success of DT in organizational operations can be measured.
- Failed products is how the success of DT in supply chains can be measured.
- Thinks that everyone is responsible for running DT projects in organizational operations.
- Does not know who is responsible for running DT projects in supply chains.
- Does not think that DT can be an appropriate approach for each organization/industry/supply chain.
- Does not know what advantages could result from the use of DT in supply chains.
- Supports the application of DT in businesses because "Design is everything".
- Does not Support the application of DT in supply chains.
- Has the following advices: "Hire people with experience", "hire people with curiosity", "challenge your people to think differently", and "come with new fresh ideas".

Case summary of person 2

The professor who believes in the "starting small" principle of success

- Consultant and in-house Design Executive for Brazilians and global companies in several industries and professor with over 7 years of experience in undergraduate and post-grad courses in Brazil and abroad.
- For him/her, DT is a "way to see the world". DT will be "map to non-designers use this lenses."
- He/she has been dealing with DT for more than 20 years.
- Thinks that the key skills a design thinker needs to have are as follows: Lucidity: to perceive and read the zeitgeist, the users and all the kind of signs; Envisioning: to transform those signs into insights; Action: to make those insight concrete; Resilience: to pursue the result/impact; Resilience; Accountability and faith.
- Amplifies the individual (or group of individuals) perspective over a problem, issue and/or opportunity is the purpose of DT for him/her.

- Mentions Empathy map, CSD matrix, prototyping, problem framing, storytelling, collaboration, MESCRAI as some key DT tools.
- Thinks that expending too much time on problem framing and workshops and less time in building the solution and measuring the impact could lead to failures in DT projects.
- Believes that Execution and management are the requirements for successful DT projects.
- The success of DT in organizational operations can be measured by line time reduction, CSAT increasing, funnel improvement and several other experience and/or operational metrics. He/she thinks that this is why the DT process should go till the creation, production and delivery.
- The success of DT in supply chains can be measured by focusing on operational metrics such as leading time, waiting time, number of processes/tasks to a JTBD among others.
- Holds the opinion that operation, business and design teams together are responsible for running DT projects in organizational operations.
- Thinks that operation, business, logistics and design teams together are responsible for running DT projects in supply chains.
- Totally thinks that DT can be an appropriate approach for each organization/industry/supply chain. Thinks that it needs to be moulded according to each context and need.
- Mentions that new processes, new solutions in terms of last mile tracking, new solutions for the lines, etc. as advantages of the use of DT in supply chains.
- Supports the application of DT in businesses because "All businesses started (or should) focusing on some human need. We should reconnect business with those needs"
- Supports the application of DT in businesses because "All the business started (or should) focusing on some human need. We should reconnect business with those needs".
- Supports the application of DT in supply chains because "In order to innovate and scale the business, we need to use "non process" based approaches. Here is where DT will make the difference".
- Has the following tips or advices for managers or decision-makers who want to implement DT in their organization/supply chain: "Start small, take the issue is more important for the business and build on that. After you start to be more confident, look for bigger problems. Don't try to embrace the world from the day one."

Case summary of person 3

An expert who rejects purely number-oriented approaches without creativity

- Began his/her design education at the National Institute of Fashion Technology (NIFT) before completing a faculty development program at the renowned National Institute of Design (NID) in Ahmedabad; he/she contributed to the NID for a decade.

- For him/her, DT is a human-centered approach focusing on empathy, problem-solving, and innovation as it provides a structured procedure for mastering complex challenges by putting special emphasis on end users' needs and experiences. Thinks that DT provides a valuable foundation for a strategic framework that guides through the entire design process.
- Has been dealing with DT for three decades.
- Believes that a DT should have the following skills: balance of mind (holistic thinking), logical thinking, creative and disruptive attitude, ability to absorb, understand and articulate, presentation skills, knowledge of semiotics, semantics and perceptual ergonomics, empathy & user-centric focus, collaboration & teamwork, iterative mindset, systems thinking, adaptability & open-mindedness, problem formulation & definition, research skills.
- Thinks that the purpose of DT is to "provide a structured and human-centered approach to problem-solving and innovation that goes beyond traditional problem-solving methods by emphasizing empathy, creativity, and collaboration to create solutions that truly resonate with users and address their needs." In his/her opinion, empathetic understanding, holistic problem-solving, innovation and creativity, collaboration, iterative development, user-centered solutions, practical application as well as sustainability and ethics could be achieved with DT.
- When asked about DT tools and concepts, he/she named the following: imagination and visualization, empathy and interaction, brainstorming, group discussions and collaboration, research and user observation, modeling and prototyping, Balanced thinking (right and left brain), critical evaluation, summary and synthesis, visual tools (charts, maps), presentations, execution and implementation, technology tools, user-centered design, iterative process, divergent and convergent thinking, continuous learning mindset. These tools and concepts can, according to his/her opinion, promote creativity, collaboration, and the ability to find creative solutions.
- Has no personal experience of failed DT projects, but based on his/her knowledge of the industry, he/she mentioned lack of empathy, insufficient collaboration, rushed solutions, resistance to change, misinterpretation of insights, lack of iteration, insufficient resources, ignoring complexity design, insufficient acceptance, overthinking and analysis paralysis, no definition of clear goals, no consideration of technical feasibility and ignoring the cultural context as common reasons for failure.
- The requirements for successful DT are to understand that "god is in the details" and that one's own understanding, one's own worldview, can become a barrier. He /she has contributed to many successful DT for weavers in Kashmir. They faced the problem of "lack of demand" and then brought back a technique that got extinct 70-years back, resulting that the same fabric now could sell at much higher prices, resulting in increasing. The gratifying result was that more and more weavers started to join the group and find sustainable livelihood.
- When measuring the success of DT in organizational operations, both qualitative and quantitative assessments should be included; everything starts with a clear definition of goals before the DT project begins. It is also important to set these goals as part of DT with the organization's overall mission and the specific problem being addressed.

- When asked how the success of DT in supply chains can be measured, he/she noted that supply chain is not the right term if it is used in the same breath as DT. Instead, the word value chain should be used here, where each step of SCM builds value or adds value to the so-called 4P's (product, process, people and planet). Based on the alignment with the 4P's, it can be measured to what extent DT has led to the development of products that meet customer needs (product value), - to what extent DT has led to streamlined processes, reduced waste, and improved resource utilization (process value), - the extent to which employee satisfaction, engagement, and stakeholder relationships have changed for the better (people value), - the extent to which DT has contributed to more sustainable practices, a smaller ecological footprint and greater social responsibility (planet value). It is also important to measure the potential for sustainable value creation, i.e. whether the improvements achieved by DT still bring added value when circumstances change.
- Holds the opinion that there needs to be a special person like Chief Design Officer (but no CEO, CTO, CFO and others) that is responsible for running DT projects in organizational operations.
- Thinks that a person who has been trained in Left and Right Brain (e.g. design management graduates) could be responsible for running DT projects in supply chains. He/she thinks that DT can be an appropriate approach for each organization/industry/supply chain since most of the industry is linear (linear means focusing mainly on profit and ignoring everything else) and not circular (circular in the sense of holistic with consideration of all stakeholders).
- Advantages that could arise from the use of DT in supply chains are: Mechanical to Organic, Waste to Sustainable, AI to Humane and much more, the whole approach would change, the process would not be mind driven, but would have a heart inside, which means compassion and empathy that could create better quality of life.
- Supports the use of DT in businesses because he/she thinks it is important to look a world beyond number games and that could only be achieved through DT as it is more holistic and organic. He/she rejects the conventional approach devoid of creativity and compassion.
- Supports the application of DT in supply chains because he/she wants "a shift from conventional SCM to Value Chains and only DT is the tool to achieve it."
- When asked for tips or advice for managers or decision-makers who want to implement DT in their organization/supply chain, he/she recommended Prof Henry Mintzberg 'Crafting Strategy' in Harvard Business review as a great example, and also gives the link to an article called "Crafting Strategy: The Harvard approach" (<https://craftvillageblog.wordpress.com/2016/03/17/crafting-strategy-the-harvard-approach/>)

6. Summary and conclusions

The present research aims to make statements about whether Design Thinking (DT) could be a suitable approach for supply chains and whether this could lead to more success. To answer this question, the researcher conducted a literature review, presented and critically examined a

practical application of a concrete supply chain, and distributed a questionnaire study consisting of 17 open-ended questions to DT experts and practitioners. In addition, the researcher contacted a person who was directly involved in applying "deliberate creativity" and "wide evaluation" to capture a more differentiated perspective on the topic.

In the present research, the researcher did not attempt to clarify what DT is in the literature, although diverse definitions and opinions regarding the concept were present during the process. Some referred to it as a toolbox or a process, while others referred to a method(ology) or mindset.

One research participant pointed out that DT is a clever marketing idea and is heavily marketed by consultants to market more services. Another participant did not mention the marketing idea, but it was clear from the statements that he or she had been using this concept for a long time although he or she was not aware of the DT concept before the practice became more prevalent. This response suggests that people have been considering creativity as a means to find effective solutions to complex problems for ages.

There were 11 completed, highly extensive open-ended questionnaires with 17 questions (see attachment for sample questionnaire), which already provide an adequate basis for discussion. It should be noted that these are interim results and that the research should, if not must be, continued.

Many participants supported the use or application of DT in businesses and supply chains because **"design is everything"**. They believed that creativity projects can make the world a better place. DT might clarify biases and explore better solutions because it may trigger a change in business direction. It offers a framework for creative problem-solving and the chance to clarify their vision, reorganize their operations, and enhance the efficiency of supply chains. It is important to use "non-process"-based approaches to innovate and scale the business as it keeps the customer and the product at the top of the priority list. It is a good step towards innovation since it offers the opportunity to **out-think competitors** and **overcome the take-make-waste approach in supply chains**.

One participant suggested that since DT processes would depend on the goal or problem that they address, they may not work the same way for different organizations. However, another participant believed that the approach is applicable in any situation because people can become creative anywhere and at any time. One other participant added that DT is suitable across different organizations because the process of identifying problems, empathy, active listening, and goal mapping is consistent across organizations, industries, and supply chains. One participant was also of the opinion that DT can be used anywhere, but the approach needs to be molded according to each context and need. Since "it is always about the product and the customer".

This study's interim results show that there is a great deal of diversity as to who can be responsible for running DT projects in organization operations or supply chains. While one thinks that it should be those who have the strongest interest in "making the world a better place", another suggests collaborating with a consultant or academic is the most effective way. In the supply chain context, one answered the question by saying that there should be a mixed DT team consisting of supply chain managers and those responsible for maintaining supply chain efficiency.

These responses show that there is no clear consensus about what DT is, who is responsible for the DT process, what skills design thinkers should have, what purpose DT has, how to measure its successes, and what the essential requirements for successful DT projects are. Therefore, this study cannot provide clear answers yet as to whether DT is now a recommended path for supply chain success. However, this study concluded that a combination of **creative and number-based approaches** is highly likely to produce innovative ideas. However, creative ideas alone are not enough; they always need someone who listens to and approves them.

Therefore, this study has outlined the following recommendations for managers and decision-makers based on participants' responses:

- involve end users throughout the process
- be aware of how to resource big ideas
- hire people with experience and curiosity
- challenge people to think differently
- be clear on the terms and flow
- lead from the back, observe more and react less
- implement testing and team empowerment
- get familiar with DT practices and loop in stakeholders early
- start small and, after being more confident, look for bigger problems
- always have a product-first and customer-first mindset
- understand what comes after DT

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Your experiences, opinions, and positions make this work valuable for the research community. Thank you!

Abbreviations

DT	Design Thinking
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CSAT	Customer Satisfaction
CSD matrix	Certainties-Suppositions-Doubts matrix
CTO	Chief Technology Officer
JTBD	Jobs-to-be-done
MESCRAI	Modifique, Elimine, Substitua, Combine, Rearranje, Adapte, Inverta
SCM	Supply Chain Management

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A global glance on growth of GDP (Gross Domestic Product) AFTER implementing GST (Goods and Service Tax)

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Abstract

Goods and Service Tax is one of the most harmonized regime in the world more than 175 countries were adopted this regime at present scenario (2023) and it also called as Value Added Tax (VAT) in the world. France was the first nation to implement the GST at 1954; it eliminates the tax evasion and cascading effect. This regime creates changes in the economic growth of the nations. The economic growth of the nation is probably explored by their GDP. Hence the present study the consistency if the GDP of the selected countries which has implementing GST in recent years. The data were collected from secondary sources and analyzed by using Mean, SD and CV.

Key Words: GST, GDP and Global.

Introduction

In the world a nation's economic strength probably depends on the tax structure i.e. fiscal policy and it play a pivotal role for mobilization of the resources for the economic development. According to the most recent estimates from the International Centre for Tax and Development, total tax revenues account for more than 80% of total government revenue in about half of the countries in the world and more than 50% in almost every country¹. GST is a well harmonized tax regime in the world and it called as VAT in some other countries; at present more than 175 countries were adopted this regime. France was the first nation introduced the GST to the world in 1954². It is a consumption based tax imposed on goods and services implementing for the purpose of avoid the cascading effects and to stamp out the tax evasion. Nevertheless the GDP of the nation is also the crucial phenomenon for economic activity of the nation. This regime obviously creates changes the corporate sector and it facilitate to deal with the extent of the export and import transactions. A country's GDP probably increase from the tax revenue besides GST or VAT is the exclusively regime to attain it.

Statement of the problem

GST is a well harmonized tax system in the world. This regime implementing still exists from the 1954 onwards. Most of the countries get huge tax benefits by adopting this tax policy. It induce the researchers whether this regime provides gradual growth in GDP of the top economic growing countries in the world in recent years and it facilitates them to deal the economic recession in future at a glimpse. The study posed the following research question:

- Is there any growth in the GDP of the top ten countries in the world after implementing GST?
- Is there the consistent growth in GDP after GST implementing countries?

Objective of the study

To analyze the growth of GDP after implementing GST

Scope of the study

The present study examined consistency in growth of GDP of GST implementing countries in recent years. There are 195 countries the world among them 175 countries implementing GST. The present study has been selected top ten economic growing countries in the world. Data were collected from official website of IBRD from 2018-22 and other web sources.

Limitation of the study

The present study analyses the consistency in growth of GDP of GST implementing countries in recent years only. The study has been selected top ten countries only by adopting Judgement sampling method.

Review of literature

The existing studies scrutinized the Global glance about GST and its features compared with Indian tax regime.

Yogita Beri (2017)³ has conducted a study on Goods And Service Tax (GST) – A Global Scenario with the aim to scrutinize the significance of GST, justify the GST in India on the basis of global experience. This Study was based on descriptive research method and data were based on Government published records and available secondary sources. The study found that GST was the prominent tax regime in the world, 160 countries were adopted. India implemented at 2017 the rationale of this regime brought transparency and induces more countries to implement including developed countries.

Mahesh Koolwal and Sachin Sharma (2020)⁴ examined the Gst Model: Indian And Global Perspectives. The aim of the study was to understanding the theme and evaluated the peculiars of GST laws. This study was based on descriptive and conceptual. The data were collected from secondary sources like Government, magazines and other web sources. The study has found that most of the countries GST rates are based on single rate tax. Among the 160 countries high tax rate implemented by Netherlands and lowest tax rate implemented by Canada and Jersey. All those countries are faced positive and critical changes after implementation of GST. It unified the Indian market with rest of the world and it pinpoint the existing studied point, GST has long term influence and the model is inadequate to account for the growing importance of services trade in both local and foreign commerce.

Taufik Abd Hakim *et.al* (2022)⁵ scrutinised the Impact of direct and indirect taxes on economic development: A comparison between developed and developing countries. The study has based on empirical research method and data were collected from the secondary sources of 90 developing countries and 47 developed countries, analyzed by regression and Hasuman test. The study has found that low population and limited migration in high-income countries seem to promote more social and economic problems, whereas higher population growth may slow down the development in low-income countries and the correlation between developing and developed economic growth and tax structure was negative.

The existing studies illustrated that GST regime a great phenomenon for both developing and developed countries in the world to promote the economic growth to attain sustainable development. It stimulate the researchers to study the GST on GDP in the world at glance and examined their consistency in GDP after implementing GST.

Research methodology

The reliability and validity of the present study was described by the researchers as follows:

Source

The present study was based on secondary data collected from official web portal of IBRD from 2018-22 and other web sources and journals.

Sample size

Top ten economic growth rate countries were selected for the study by Judgement sampling method. Here the Judge is IBRD.

Statistical tool

The data analysed by Mean, SD and CV.

Analysis and interpretation

The consistency in growth of GDP of GST implementing countries in recent years has been analyzed by using Mean, SD and CV (Coefficient of Variation).

- The top ten selected countries were shown in Table 1
- GDP, Mean, SD and CV of the selected countries were shown in Table 2

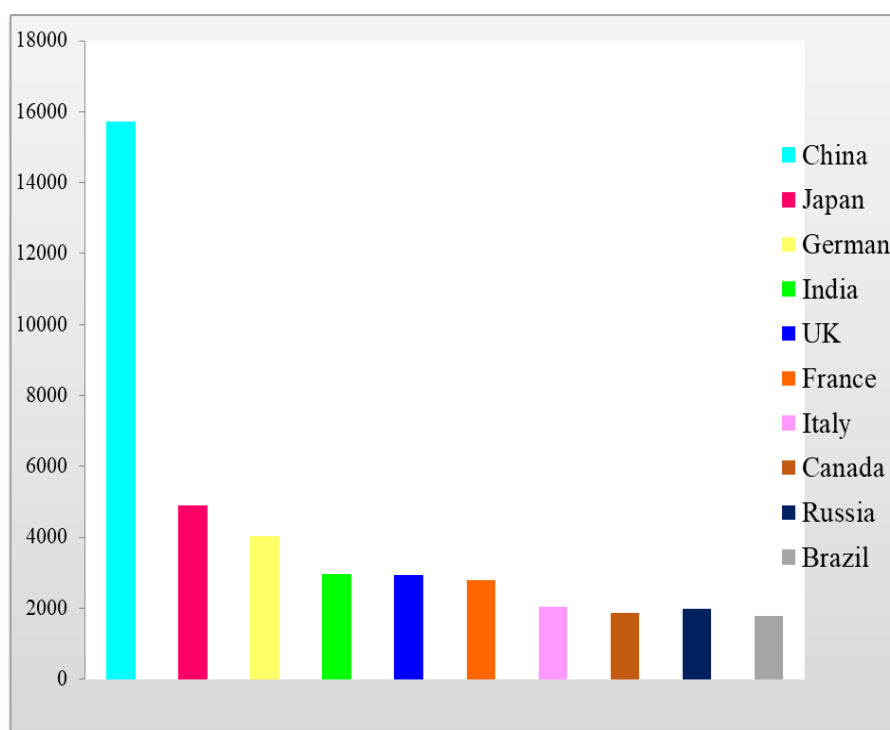
Table 1
Top Ten Countries implementing GST or VAT

S. No.	Name of the Country	Years
1	China	1994
2	Japan	1989
3	Germany	1968
4	India	2017
5	United Kingdom	1973
6	France	1954
7	Italy	1973
8	Canada	1991
9	Russia	1991
10	Brazil	1964

Table 2
Consistency in Growth of GDP after Implementing GST from 2018-22

Years	2018-19	2019-20	2020-21	2021-22	2022-23	Mean	SD	CV (%)
China	13894.82	14279.94	14687.67	17734.06	17963.17	15711.93	1972.22	12.55
Japan	5040.88	5118.00	5048.79	5005.54	4231.14	4888.87	369.93	7.56
Germany	3976.25	3888.66	3886.56	4262.77	4075.4	4017.92	157.28	3.91
India	2702.93	2831.55	2667.68	3176.29	3385.09	2952.71	314.34	10.64
UK	2878.15	2857.06	2704.61	3131.38	3071.00	2928.39	172.60	5.89
France	2792.22	2729.17	2635.92	2957.42	2784.02	2779.75	117.24	4.21
Italy	2092.88	2011.52	1895.69	2115.76	2010.43	2025.25	86.54	4.27
Canada	1725.30	1743.73	1647.60	2001.49	2139.84	1851.59	209.01	11.28
Russia	2653.01	1695.72	1488.12	1836.63	2240.42	1982.78	464.76	23.44
Brazil	1916.93	1873.29	1476.09	1648.70	1920.09	1767.02	197.38	11.17

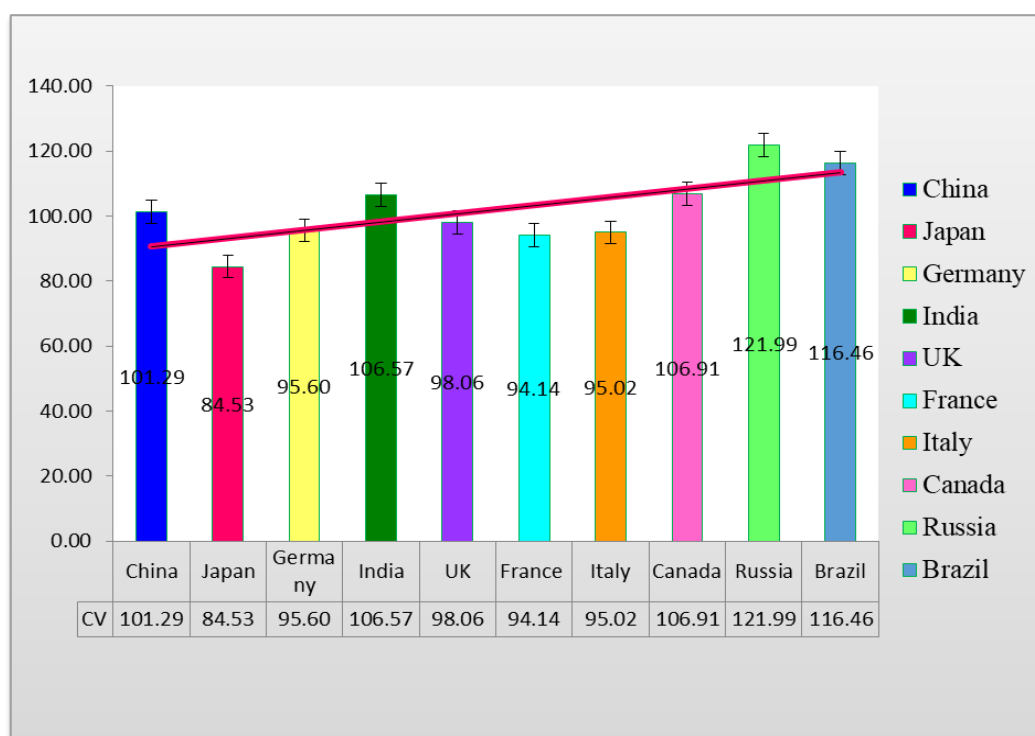
Figure 1



The Table 2 and Figure 2017 illustrates that the consistency in growth of GDP after GST of the selected countries during 2018-22. Based on the result the consistency of Germany was

flawless and it leads in top position. The consistency of France, Italy and UK are excellent during the study period. Among the selected countries Germany sustains their GDP rate during the pandemic too. The percentage of CV is slow down for Japan. In overall the country's economic growth rate proved that are too good.

Figure 2



The above Figure illuminates the Trend line of the top ten countries from 2018-2023.

Findings

Among the selected countries China mean value is excellent. Nevertheless their consistency on GDP is need to be enhanced

The consistency of Germany, France, Italy and UK are phenomenal.

The GDP of Japan and India are good enough

The study found that all the selected countries GDP growth knock down by COVID-19 except GDP of Germany

Suggestion

The countries should sustain their economic position to face upcoming diplomatic problems with their consistent growth.

Conclusion

The present study examined the “A Global Glance on Growth of GDP (Gross Domestic Product) After Implementing GST (Goods and Service Tax) from 2018- 2023 of top ten economic growth rate countries. The study has found that the consistency in growth rate of GDP. The result revealed that the GST is a harmonized tax regime, the unique features of this regime facilitates the countries to sustain their economic growth.

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A Novel Algorithm for Professor Recommendation in Higher Education

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Abstract

This paper introduces a novel professor-recommendation system designed specifically for community college and university courses. Building upon an existing algorithm for one-on-one teacher recommendations, we leveraged insights from the literature on Massive Open Online Course (MOOC) recommender algorithms. By analysing various approaches, we combined and refined ideas to develop an optimised system. Our approach utilises a tri-module framework that incorporates supervised and unsupervised learning techniques. The first module employs a Gradient-boosted Decision Tree algorithm, augmented with multiple factors and student dropout rates as ground truth, to generate a ranking score. The second module applies Apriori Association and Density-based Spatial Clustering of Applications with Noise (DBSCAN) algorithms to analyse these factors and identify professors with similar characteristics. In the third module, item-based collaborative filtering is employed, incorporating user ratings and the cosine similarity algorithm. The outputs from these three modules are subsequently integrated through a weighted average. This addition enables the system to prioritise opportunities for new professors, thereby ensuring a balanced recommendation approach. The resulting combined ranking score provides accurate recommendations for course instructors. This approach can be integrated into university course selection software for the benefit of both students and educational institutions.

Key words: Education, Machine Learning, GBDT (Gradient-boosted Decision Tree), Intelligent Recommendation System

1. Introduction

Having a good professor can make a substantial difference in a student's learning experience and understanding of the subject. However, for many community college and university students, deciding on a professor to take a class from can be a difficult task. Although there are several websites and services where students can rate professors, oftentimes "the wisdom of the crowd" alone cannot cater perfectly to a student's preferences. Different students expect different qualities from their professors, and what may qualify as a good professor to one may mean the opposite to another. This conflict in student preferences leads to professor ratings being an inadequate measure to cater to students' personal preferences and learning styles. This reveals a major issue with using subjective, crowdsourced metrics for professor recommendations. However, both subjective and objective analysis have major issues that prevent them from being reliable metrics for gauging the relative quality of a professor:

- Subjective analysis results in data which is difficult to interpret due to the conflict between multiple students' preferences, learning styles, biases, etc.
- Objective analysis can give deterministic, interpretable data, but this data is meaningless if it does not effectively translate to individual student preferences.

This paper aims to supplement an objective approach with subjective elements to create a professor ranking model that can both give useful, interpretable data and also cater to individual student preferences. This is achieved by analysing the literature on teacher recommendation approaches for both one-on-one courses and Massive Open Online Courses (MOOCs). Each approach is analysed and compared to derive a single, complete recommendation system.

2. Review of existing recommendation system approaches

As a starting point for this paper, we decided to use Chen et al. (2021) due to its fully objective approach, making use of only quantifiable data and not any user ratings. Chen et al. (2021) outlines an algorithmic approach for teacher recommendation for one-on-one classes. The system makes use of a Gradient-boosted Decision Tree to make matches based on quantifiable teacher characteristics: "(1) demographic features: the demographic information of both students and teachers, such as gender, schools, etc. (2) in-class features: the class behavioural features from both students and teachers, such as lengths of talking time, the number of spoken sentences, etc. (3) historical features: the historical features aggregate each teacher's past teaching performance, which includes total numbers of courses and historical dropout rates, etc." (Chen et al., 2021:3). The network uses a pseudo-score based on student dropout rates as a "ground truth" to train the model.

In order to supplement this objective approach with a more subjective, rating-based one, we examined Verbert et al. (2011), which examined multiple collaborative filtering approaches for teacher recommendation for MOOCs. Not only does the study demonstrate the feasibility of collaborative filtering for teacher recommendation, but it also shows that for general conditions, the best method of collaborative filtering is to make use of item-based collaborative filtering, utilising Tanimoto as a similarity coefficient. Specifically, this combination performs with the highest accuracy on datasets with less user interaction, i.e., ratings.

Dai et al. (2016), on the other hand, makes use of user-based collaborative filtering instead of item-based. The paper proposes a system that makes use of LinkedIn profile data in order to find users with similar characteristics. The model generates tags based on a user's LinkedIn data in order to match users with courses that similar users enjoyed. This broad approach could be used as a general framework for a user-based collaborative filtering algorithm for professors.

Aher & Lobo (2013) makes use of an objective but personalised approach, making use of unsupervised techniques such as Apriori Association with a support percentage of 85% and K-means Clustering in order to recommend the user courses based on a multitude of factors. Although this approach is meant for recommending MOOCs specifically and not professors, it can be adapted to work with the same data points provided by Chen et al. (2021). Apriori Association can be used for non-numerical, limited data, while K-means clustering can be used for numerical data. This clusters teachers into possible groups, allowing the software to recommend teachers in the same cluster as teachers the student enjoyed previously.

Bousbahi & Chorfi (2015) takes an entirely different approach, making use of a case-based reasoning (CBR) approach to recommend MOOCs based on five main factors: course title, fees, availability, language, and location. The algorithm makes use of past circumstances to recommend courses. The paper mainly focuses on the workings of a recommender application which finds courses for the user based on whether they want to pay fees, their location, etc.

3. Evaluation of existing recommendation system approaches

Of the previous approaches, each one has certain aspects that make it more or less desirable for the use case of professor recommendation. In order to reduce algorithm complexity and computation time, inefficient or irrelevant approaches must be eliminated in order to create a streamlined system.

Chen et al.'s (2021) objective approach makes use of data points that are very relevant to the task of professor recommendation. Although Chen et al. (2021) is centred around recommending one-on-one courses, every single one of its data points is applicable to university courses as well. As a result, this approach should be included in the system.

Verbert et al. (2011)'s item-based collaborative filtering, on the other hand, is a broad approach that can be applied to both MOOCs and university courses. Since students often have certain traits they prefer in professors, item-based collaborative filtering allows personalisation in professor ratings. Since rating professors is already an existing concept, this approach can be well-integrated into the recommendation system. However, although Tanimoto similarity may perform the best for sparse datasets, it is not optimal for non-binary data such as user ratings, which may range from 1-5. As a result, to implement item-based collaborative filtering, the cosine correlation algorithm is much more optimal.

Dai et al. (2016)'s approach classifies users based on their LinkedIn profiles and suggests courses enjoyed by similar users. However, what must be considered is how much one's LinkedIn profile may suggest about their professorial preferences. Since Dai et al. (2016) originally dealt with MOOC recommendation, it is easy to understand how a LinkedIn profile may impact the subjects in which they are interested. For example, a user's education and bio may impact which subjects they are interested in. However, a LinkedIn profile alone cannot

give meaningful data on a user's professorial preferences. As a result, this approach is irrelevant to our use case.

Aher & Lobo (2013)'s approach is unique yet broad, utilising an objective approach that is also personalised. The data points used for this approach can be almost anything, including the predefined data points of Chen et al. (2021). The fact that this makes use of objective data points means that it can provide interpretable data for the recommendation system. Its ability to personalise recommendations based on these factors also addresses the shortcomings of purely objective approaches like Chen et al. (2021). As a result, this approach can be integrated into the recommendation system. However, instead of using k-means clustering, it would be more optimal to use the Density-based Spatial Clustering of Applications with Noise (DBSCAN) clustering algorithm due to its better tolerance for outliers and lack of need to specify the number of clusters.

Finally, Bousbahi & Chorfi (2015)'s Case-based reasoning (CBR) approach is a broad one that can be applicable to multiple use cases. However, Bousbahi & Chorfi (2015) only makes use of five factors in its model, far less than the factors described in Chen et al. (2021). Due to this, it is doubtful whether CBR can reliably handle the amount of data required in this recommendation system. As a result, CBR is not a feasible addition to the recommendation system.

Of these 5 possible approaches, only Chen et al. (2021), Verbert et al. (2011), and Aher & Lobo (2013) will be used in designing the recommendation system due to their scalability, interpretable data outputs, and adequate personalisation.

4. Proposed system

In order to create the final system, we propose a tri-module system that makes use of both supervised and unsupervised learning techniques and both objective and subjective data. In order for the system to function properly, it must have access to detailed user rating information detailing how each user rated each of their professors (subjective data points). It must also have access to each of the data points detailed in Chen et al. (2021:3) for each professor: demographic features, in-class features, and historical features (objective data points). All numerical data points are normalised from 0 to 1 on a linear scale for range-limited data and an exponential scale otherwise.

4.1 - Module 1: Gradient-boosted decision tree

The first module makes use of a Gradient-boosted Decision Tree module very similar to the one used in Chen et al. The module is trained using all of the objective data points from Chen et al. (2021:3), using a pseudo-score based on student dropout rates as a "ground truth" in order to guide the training of the model. This pseudo-score is calculated by using equations sourced from Chen et al. (2021:2). The pseudo-score is calculated differently based on whether it is positive or negative:

Positive score: For student s_i who has finished the class, let \mathbf{T}_i be the set of all professors who have taught student s_i where t_j represents the j th professor in the set and p_i is the number of professors in the set. Let $M_i(t_j)$ be the number of class sessions taught by professor t_j . The positive pseudo score $P(.,.)$ is defined as:

$$P(s_i, t_j) = \frac{M_i(t_j)}{\sum_{n=1}^{p_i} M_i(t_n)}$$

Negative score: For student s_k who has dropped the class, with similar notations as the Positive Score, the negative pseudo matching score $N(.,.)$ is defined as:

$$N(s_k, t_j) = -\exp(1 - M_k(t_j))$$

According to these definitions, the pseudo matching score of each professor ranges from -1 to 1. The score reaches a maximum of 1 when the student completes the entire class and never requests a change of professor. The minimum of -1 is reached when the student drops a class immediately after the first session. To calculate an individual professor's pseudo-score, the pseudo score for each student that the professor has taught is averaged.

4.2 - Module 2: DBSCAN clustering and apriori association

The second module makes use of Density-based Spatial Clustering of Applications with noise (DBSCAN) clustering and apriori association in order to group together professors with similar qualities and recommend professors who have similar characteristics to professors that the student has enjoyed in the past. Making use of the objective data points mentioned earlier, DBSCAN clustering is applied to numeric data types (lecture length, etc.), while apriori association is applied to non-numeric data types (gender, etc.).

Firstly, the module must compile a list of all professors, which is referred to as set \mathbf{T}_i , to whom the student has given a rating of 3 or more points out of a maximum of 5 points. Each professor is weighted simply by repeating their occurrence in the list based on their rating; a professor rated 3 points appears only once, while a professor rated 5 points appears three times.

4.2.1 - Apriori association sub-module

Making use of set \mathbf{T}_i , a classic apriori association or comparable implementation is used to mine association rules based on non-numerical data points of this dataset. Each association rule gives a score of either 1 if the professor meets the rule or -1 if the professor does not meet the rule. The professor's final score is calculated as follows:

Score calculation: For professor t_i , let \mathbf{R}_i be the set of professor t_i 's score on each association rule, where r_j represents the j th score in the set and p_i is the number of scores in the set. Let \mathbf{S}_i be a set of length p_i containing each association rule's support percentage from 0 to 1, where s_j represents the j th support in the set. The professor's overall score $F(.)$ is defined as:

$$F(t_i) = \frac{\sum_{j=1}^{p_i} r_j s_j}{\sum_{j=1}^{p_i} s_j}$$

This definition returns -1 if the professor does not fit into any association rules and 1 if the professor meets all association rules.

4.2.2 - DBSCAN clustering sub-module

The Density-based Spatial Clustering of Applications with Noise (DBSCAN) clustering algorithm is used to group similar professors into clusters. A professor's score is calculated differently based on whether it is positive or negative:

Base definition: For professor t_i , let \mathbf{C}_i be the set of all clusters which contain any member of set \mathbf{T}_i , where c_j represents the j th cluster in the set \mathbf{C}_i and p_i is the number of clusters in the set \mathbf{C}_i . Let $D_i(t_i, c_j)$ be the Euclidean distance of professor t_i from the centroid of cluster c_j . Let $N_i(c_j)$ be the number of professors from set \mathbf{T}_i contained within cluster c_j .

Positive score: Utilising the base definitions, for professor t_i who is contained within any of the clusters in \mathbf{C}_i , the positive score $P(.)$ is defined as:

$$P(t_i) = \left| \frac{\sum_{j=1}^{p_i} D_i(t_i, c_j) N_i(c_j)}{\sum_{j=1}^{p_i} N_i(c_j)} - 1 \right|$$

Negative score: Utilising the base definitions, for professor t_i who is not contained within any of the clusters in \mathbf{C}_i , the negative score $N(.)$ is defined as:

$$P(t_i) = - \frac{\sum_{j=1}^{p_i} D_i(t_i, c_j) N_i(c_j)}{\sum_{j=1}^{p_i} N_i(c_j)}$$

This sub-module returns a minimum score of -1 if professor t_i is not within any of the clusters in \mathbf{C}_i and has a Euclidean distance of 1 from the centroid of every single cluster in \mathbf{C}_i . The sub-module returns a maximum score of 1 if either there is only one cluster in \mathbf{C}_i or all the clusters overlap completely, and t_i is the shared centroid of the overlapping cluster.

4.2.3 - Score combination

In order to create a final score for the module, the two scores from the two submodules are averaged, returning a score from -1 to 1.

4.3 - Module 3: Item-based collaborative filtering

The third module makes use of item-based collaborative filtering using the cosine similarity algorithm. The module calculates a professor's score as follows:

Score Calculation: For student s_i and for professor t_i whom student s_i has not yet rated, let \mathbf{S}_i be the set of all students who have participated in the rating system, and let \mathbf{R}_i be the set of each student in set \mathbf{S}_i 's rating of professor t_i from a scale of 1 to 5, or 0 if the particular student has not rated professor t_i , and r_j represents the j th rating in the set. Let \mathbf{T}_i be the set of all professors which student s_i has rated, where t_j represents the j th professor in the set and p_i is the length of the set. Let \mathbf{N}_i be a set of length p_i containing student s_i 's rating of each teacher in set \mathbf{T}_i from a scale of 1-5, where n_j represents the j th rating in the set. Let $K_i(t_j)$ be the set of ratings given to professor t_j by every single student on a scale of 1-5 or 0 if the

particular student has not rated professor t_j . Let $S_i(k_j)$ be the cosine similarity coefficient between set of ratings k_j and set \mathbf{R}_i . The collaborative filtering score $F(\cdot)$ is defined as:

$$F(t_i) = \frac{1}{2} \left| \frac{\sum_{j=1}^{p_i} S_i(K_i(t_j))n_j}{\sum_{j=1}^{p_i} S_i(K_i(t_j))} - 3 \right|$$

This module returns a minimum of -1 when professor t_i is likely to receive a rating of 1/5 and a maximum of 1 when professor t_i is likely to receive a rating of 5/5.

4.4 - Module Combination

Once all three modules have returned a score, the scores are combined to create a singular, final score. Since modules two and three rely on user ratings, if the user has not rated any professors, the modules are not activated, and module 1 gives the final professor score. Otherwise, the average score of all three modules is the final score, ranging from a minimum of -1 to a maximum of 1.

Conclusion

In conclusion, utilising a tri-module approach to professor recommendation allows for the combination of both objective and subjective data, which allows for a more complete picture of each professor. This approach also tailors recommendations to each student's preferences, increasing the likelihood that students will find professors they enjoy working with. This algorithm can serve as a useful resource for both students and educational institutions, assisting students in finding the best professors and allowing educational institutions to ensure a higher quality of education. Some possible applications for this algorithm are the integration of the recommendation system and a rating system into a university's course selection software, allowing students to choose professors that fit them better and increasing the number of ratings for each professor, allowing for better personalisation.

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AI Proctor: AI-Based Platform for Remote Learning

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Abstract

Progressions in technology give headway to remote exams as a good alternative to on-site proctoring. Due to the COVID-19 pandemic, educators and institutions have been forced to rely on remote synchronous and asynchronous operations. The rapid change left weaknesses in the old systems to surface. Furthermore, it is questionable that they are equal in function to on-site proctoring. Grounded on thorough research, I determined the operation requirements for AI Proctor, a solution that solves many of the concerns with remote proctoring.

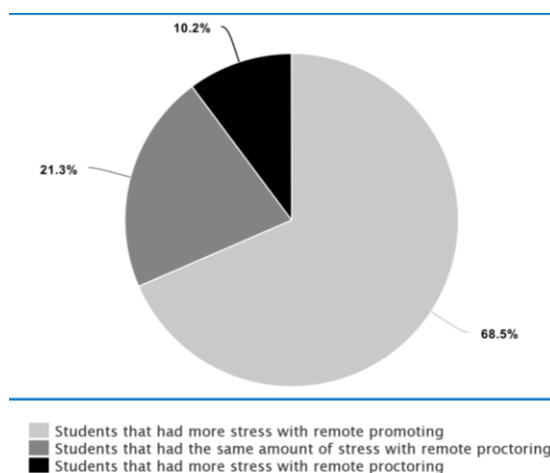
Key words: AI, Synchronous, Asynchronous, On-site Proctoring

1. Introduction

The rapid switch to remote education because of the COVID-19 pandemic left already available online proctoring solutions exposed with many weaknesses and flaws, this made managing remote exams very difficult. Without a physical proctor students were left more opportunities to cheat, requiring the use of remote testing sites. These testing sites had several limits on what it could and couldn't detect, in effect this made the testing experience for the students very stressful and demanding. The sites required many criteria for the student to be monitored causing an increase in pressure for the students. The results of said tests have also been affected by lacking remote proctors. Table 1.[1] Illustrates the comparison between in-person and remote exam proctoring stress levels. Privacy of students is also a concern due to complete access to students' data. Some solutions attempt to combat cheating with other applications and tools. These solutions come with their own problems,

such as more invasiveness and privacy infringement, these solutions also do not come cheap in Table 1.

Table 1. Stress correlated to proctor style



None of the available tools come even close to matching in-person levels. AI proctor is a new platform aiming to reduce the invasiveness of existing software, while adding a much less demanding experience.

2. Identifying Requirements

This primary research I reviewed is based on 200 interviews and 150 survey responses from both students and staff at a High-school. The research is also backed behind multiple narratives from both social media perspectives and literature [1,2,3,4]. I have indicated that while students are concerned with privacy and stress, staff and faculty are concerned with cheating. I concentrated this data to understand the challenges in remote education and better solutions to address them. I created a list of all possible cheating scenarios and facile solutions. I finally combine all of this data into a framework of systems that create a collection of simplistic features and functions for the AI-based proctoring tool[5].

3. System Components

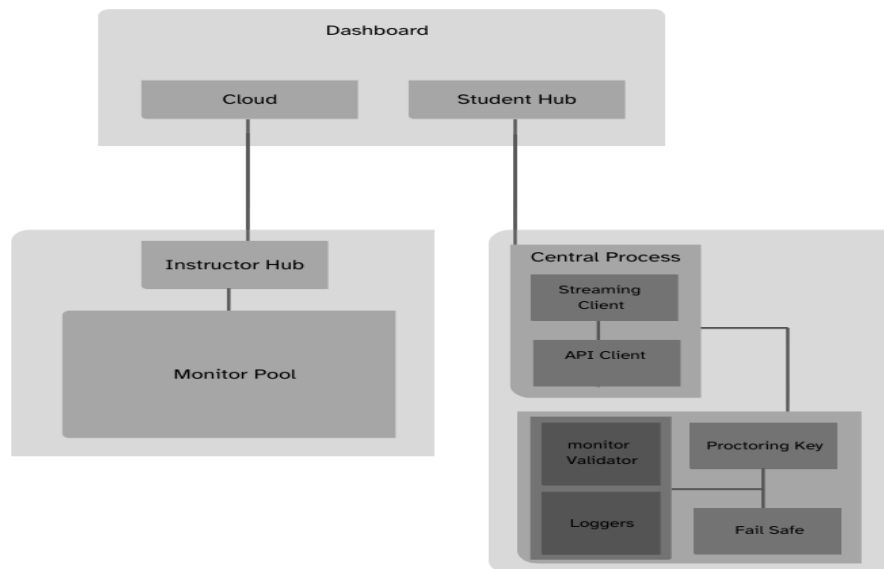


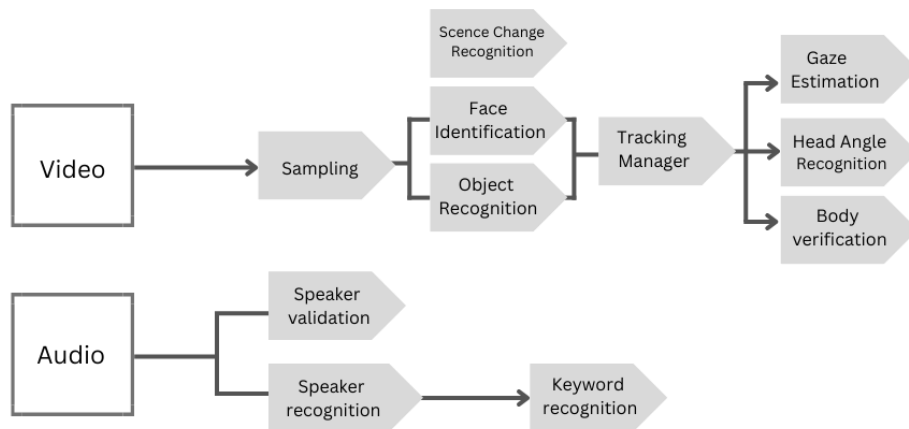
Fig 1. AI proctor system components

Student Hub. The student hub was designed to leave a stress free or reducing experience for remote test takers. Before the test begins all students must recite an honor code [6,7] for even further security. The student hub is equipped with a monitor validator which houses all of AI Proctors' testing measures, such as screen and video monitoring, Audio detection and recognition, and cursor watchers [8,9] to eliminate all if not most cheating attempts.

Cloud Service. The instructor hub allows teachers and instructors to have an even easier experience when scheduling exams and tests [10,11], approve sign-ups, design and customize exam features. The instructor is given very flexible options when creating exams and many options to tailor the proctor. The instructor also receives reports from the monitor pool about any suspected cheating attempts [12]. This provides the necessary security to prevent any sort of cheating. This is effective but is also more time-consuming to make sure any and all cheating attempts are thwarted.

4. AI-Powered Components

AI proctor utilizes AI components that allow various proctoring and testing features. Fig 2. demonstrates these components.



Video Solutions. Face identification authenticates a test taker's gaze, head angle, and body.

I use a sub variation of Face ID [13] and test on the SC test manager [14], providing an accuracy percent of 92%. For the verification of the test taker's gaze, head angle, and body, I utilize GoGaurdian [15]. Gaze estimation accurately determines the direction of the test taker's attention. Head angle recognition finds and recognizes where the test taker is putting any other attention on. Body verification verifies that the tester is keeping their arms and body on their computer or something else for the test. Object recognition is used to monitor parts in the user's webcam. Anything that triggers a flag such as another screen, papers, or other tools that people might use to cheat.

Audio Solutions. Unlike other remote proctors, AI Proctor uses both speaker validation and recognition. Speaker verification is used to confirm there is only one voice heard. It can differentiate both language and tone of voice. I use Veriff [16] which reports an accuracy of 67.02% across 1000 data points. Speaker recognition recognizes and transcribes all captured audio. I use CMU Sphinx [17], this software reports one of the lowest error rates of almost all audio recognition softwares at only 6.74%. Key-word extraction uses Veriff as well [16] to recognize any of the words that may trigger key-word analysis. Rapid Automatic Key-word Extraction [18,19] is also used to recognize any other triggers.

5. Conclusion

AI Proctor is a user-centric solution developed to help shape the and improve the remote proctoring challenges on both the user and instructor sides. AI Proctor addresses privacy and network issues, feasibility, affordability, and overall stress for everyone. It offers an extensive monitoring platform to prevent all forms of cheating. It utilizes distinctive AI-powered audio and visual analysis programs. As AI continues to grow and branch, so will AI Proctor. Behavioral analysis data and psychological analysis data, will be incorporated to further progress the viability and usefulness of anti-cheating mechanisms.

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Charisma and learning: designing charismatic behaviours for virtual human tutors

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Abstract

Charisma as defined in the oxford dictionary, is the compelling attractiveness or charm that can inspire devotion in others. It is a powerful device of communication because it is the primary way humans signal interpersonal closeness, willingness to communicate and feelings towards one another. Without exception, charisma is very crucial in the learning process in individuals. It makes the teachers more influential, causing learners to listen more intently to what they have to say and subsequently boosting their learning performance at the end of the day.

Virtual learning has become a widely adopted phenomenon all around the world, with the aid of virtual humans (computer generated simulations of human beings), who unlike real humans, provide consistency in delivery of accurate knowledge, engaging role-plays and appropriate feedback. Furthermore, pedagogical agents have played a significant role in virtual learning, virtual tutors and companions falling under this category. Incorporating charismatic behaviors in virtual human tutors has become a quest for developers, due to their awareness on how impactful it can be in virtual learning. How can such behaviors be realized in a virtual character? Developers are incorporating charismatic traits in virtual human tutors which include: portraying a high degree of engagement with their student, proficiency in their subject matter, organized and very profound in their knowledge of the subject. Taiwanese authors researched on the topic of teaching and charisma. The Statistical results obtained supported the virtual human tutors' charisma has a positive influence on inducing the students' learning interest.

Feelings of isolation which may be faced by a student in online learning is overcome by the fully-present and approachable trait of the charismatic virtual tutor. Ability of a virtual human tutor to be charismatic boosts instructor immediacy; behavior that brings the instructor and the students closer together in terms of perceived distance.

Overall, we conclude that developers' endeavor to design charismatic behavior for virtual human tutors is advantageous to the highly advancing educational field and use of Artificial Intelligence in education.

Keywords: Charisma, virtual human tutors, virtual learning, pedagogical agents

1. Introduction

Charisma is a general term bequeathed to us by the German sociologist Max Weber, who studied the phenomenon assiduously.

Charisma is a personal quality of presence or charm that compels its subjects.

In recent studies, researchers discovered that charisma exerts a positive influence on the students' personal interest and situational interest, hence software developers have taken initiative to incorporate charismatic qualities for their virtual human. What exactly do you consider in developing charismatic qualities in learning? The ability to understand students especially those that are troubled and need you most, great listening skills and lastly profound knowledge of the subject being taught. With such qualities, the virtual human creates a consistent learning experience. Unlike real humans, virtual humans provide consistency; consistent delivery of accurate knowledge, consistent and engaging role-plays, and appropriate feedback. They also do not fatigue, have a neutral appearance, and are not subject to trainer bias.

The topic of charismatic behavior has a research tradition in sociology and psychology and increasingly trending in computation. In building a machine that people perceive as charismatic, a bias in human inference processes can be exploited, namely the fundamental attribution error: People tend to ascribe observed behaviors to internal factors like personality or character rather than to external factors such as situational constraints.

Before we can go any further we should ask ourselves 'can charisma be learned?' The answer to this question is yes this is because charisma is a collection of behaviors hence it can be learned. If a human can learn how to be charismatic why can't artificial intelligence?

Various researches on charisma have been conducted and analyzed and based on their findings having charisma in tutors has proved beneficial. So as to confirm this thesis we decided to carry out a small research of our own.

2. Research

To determine the important characteristics to implement in a virtual tutor, we conducted a research. The research was conducted in a learning institution in Kenya whereby students were subjected to a test after being taught by a charismatic teacher and a non-charismatic teacher. Each teacher had forty minutes to teach the same topic and another forty minutes to do the test. In the study, the main focus was on student engagement, proficiency of the teacher, teaching methodologies and effectiveness of the lesson.

3. The results

1. Student engagement

In the lesson carried out by the charismatic teacher, the student engagement was relatively better than the student engagement in the lesson with the non-charismatic teacher. The students were more interested in the topic and willingly answered questions in the class. While in the non-charismatic lesson, the students paid less attention, they were drowsy and

barely participated in the lesson. These results show the great impact of charisma in student learning

2. Proficiency of the teacher

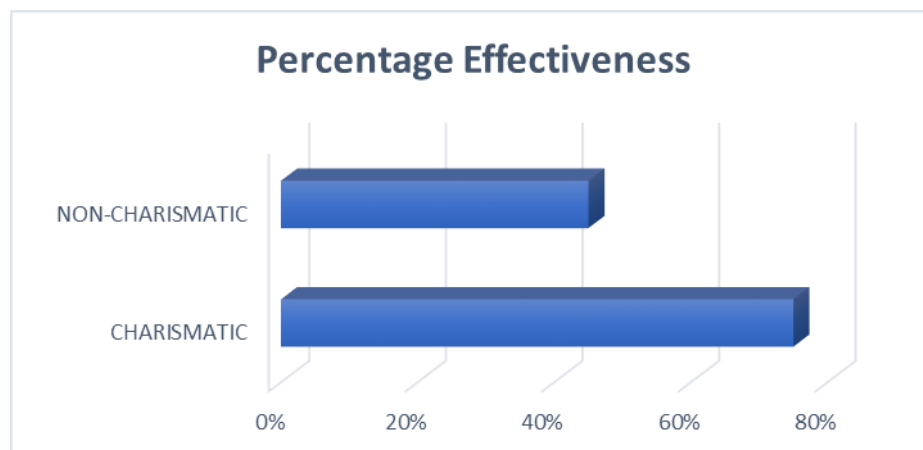
The charismatic teacher seemed to be a natural and very professional in their work. They were familiar with the topic and even introduced new concepts. It was noticed that the teacher had a passion for teaching, the ability to listen well, had a sense of humor and even communicated effectively with the students. Such qualities are useful to implement in designing charismatic virtual tutors

3. Teaching methodologies

While the non-charismatic teacher focused on using the lecture-based method, which reduced the interest of the students, the charismatic teacher focused on using kinesthetic learning (i.e using body movement and interacting with the environment), inquiry-based learning and project-based learning

4. Effectiveness of the lesson

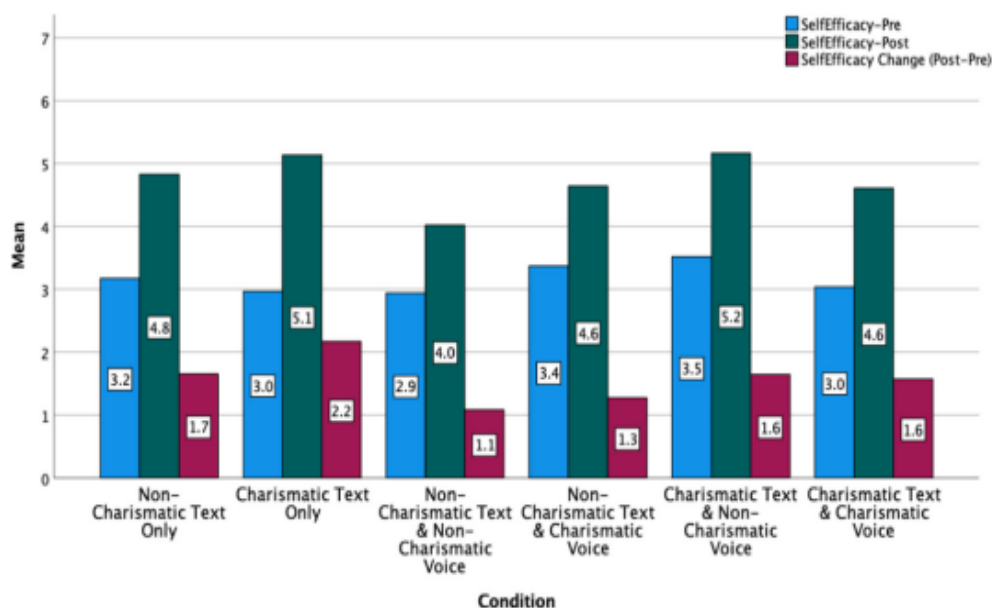
This is the most important part that focuses on the outcome of the results



The chart above shows the percentage effectiveness of the lesson towards the student's results. The charismatic teacher had a greater impact on the performance than the non-charismatic teacher. This shows that charisma is indeed an important character to be developed in virtual tutors

5. Self-efficacy

The table below shows the self-efficacy of the students obtained from the ALIVE! Testbed. Self-efficacy is an individual's belief in his or her capacity to execute behaviors necessary to produce specific performance attainments. In general charisma has a relatively great impact in AI learning. The test bed shows that having a charismatic voice must be accompanied with non-verbal charisma for effective results. The results show that the impact of charismatic strategies may depend on how they are expressed.



4. Conclusion

In this paper we discussed about charisma in virtual learning and which behaviours to consider while designing a virtual tutor. We also conducted a research to find out the impact of such behaviours in learning. Results show that the teacher's ability to engage the students increases the performance of students both in class and in the test. Despite heterogeneous conceptualization and the inherent complexity there is a consensus that charismatic individuals exert influence, comfort and connect to others hence having a charismatic virtual tutor will augment learning thus helping the students. In education for example a charismatic AI may be more engaging and captivating for the students taught by it. Overall, we envision a plethora of use-cases with eminent value of charisma in artificial intelligence.

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Effectiveness of Motivational Agents on Reducing Foreign Language Anxiety

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Abstract

Utilizing resources focused on artificial intelligence (A.I.) and its influence on education, this paper analyzes the impact of “animated agents” to aid students in learning and understanding a new language. We used these articles to understand the effect that A.I. has on the anxiety levels of students and how these learners respond to differing motivational agents. Foreign Language Anxiety (FLA) is a term used to describe the stress exhibited by learners of a new language, specifically when being negatively evaluated by others or when perceiving an inability in themselves. FLA is a major barrier when it comes to the overall growth of a student and his/her proficiency in the new language, as it increases stress and decreases motivation to learn by making students think that they are not good enough. Because this has led to a notable decline in learners’ performance in that subject, pedagogical methods have been developed and examined to provide emotional support. With a group of 56 students and an e-learning system, researchers utilized either motivational or explanatory feedback through the use of text, voice, or animated agents (characters that can engage students and present information), and measured anxiety levels across the different combinations. While the motivational support of an agent was most sufficient, gender played a big role in the efficacy of different pedagogical methods; therefore, incorporating the gender of the learner into artificial intelligence systems and animated agents in the future would personalize feedback in forms that males and females can better take in and implement. To provide more equity in education, these results can be applied to other anxiety barriers that actively prevent students from developing the skills essential for their learning. With the proper assistance from A.I., FLA can become a thing of the past, and language learners can no longer suffer from the stress of learning something entirely new.

Keywords: Foreign Language Anxiety, Motivation, Language Barrier, Education, Stress, Artificial Intelligence.

Introduction

Foreign Language Anxiety (FLA) is the negative feeling—namely worry or stress—that can come with learning a new language. While studying a foreign language, students are required to practice reading, writing, speaking, and listening; however, some can grasp this information easier while others take longer and struggle more, which only increases their anxiety (Genc, p. 135). Learners exhibiting this Foreign Language Anxiety do not view their mistakes as natural and essential to the learning process, but rather as damaging to their image and a source of negative evaluations from mentors and peers (Ansari, p. 39). FLA has become a growing problem throughout the world, especially within the United States. Research conveys that FLA has a specific negative impact on one's performance in learning English as a second language, which lengthens the educational process (Fariadian et al., p. 21). Foreign Language Anxiety has even been observed in the classroom environment, where non-native students are often hesitant to speak up and contribute to the discussion (Ansari, p. 38). Unfortunately, some teachers do not note this as anxiety, but rather as low ability or low motivation to learn, which prevents them from finding proper solutions to this issue (Ansari, p. 38). However, because of the large population of non-English speakers in the country, it is becoming increasingly important to create an anxiety-free environment in which people can learn the new language without thinking negatively of themselves. A major setback is that non-native speakers do not get the chance to practice conversing in the learned language in real life, and thus their language anxiety persists; however, several studies suggest that computer-based discussions can pose the same benefits to their skills (Ayedoun, p. 1434). Thanks to advances in technology, researchers have begun to study the use of artificial intelligence and supportive feedback to efficiently combat this phenomenon. This was accomplished through “animated agents,” which can be voice assistants or life-like characters that can assess learners in a way that motivates them to embrace the language and persevere further. Previously, studies on the interaction of humans with these pedagogical agents have shown an increase in learners' confidence and desire and a decrease in nervousness (Ayedoun, p. 1441). So for the sake of this experimentation, researchers first studied some of the feedback methods that these agents could be programmed to use, including sandwich feedback, explanatory feedback, and corrective feedback. Sandwich feedback gives a positive comment about the learners' efforts, followed by an explanation, and then another positive comment; explanatory feedback only explains the reasoning behind the correct answer; and corrective feedback, simply states if the given answer was right or wrong (Ismail, p. 202). Depending on gender and achievement level, the effects of these practices varied in use. However, to accommodate for the differences between students, it has become essential to study the solutions to Foreign Language Anxiety and ensure that everyone can receive an education that suits them and enables their success.

Instrumentation

The first study aimed to measure FLA across various methods; researchers developed an e-learning system to teach English to 56 foreign students, altering feedback type and feedback modality across the sample. The experiment was a 2 x 3 factorial design, in which participants were randomly given the condition of explanatory or motivational support, and another condition of text, voice, or agent. For the explanatory feedback type, the reasoning was

provided for incorrect and partially correct answers given by students, and for correct answers, the system stated “yes” and then gave an explanation (Prochazka 2020). For the motivational feedback type, sandwich feedback was used as the basis, in which an explanation was put in between two positive comments, such as “Super Job!” or “You tried really hard!” This framework was applied to the group of students. Once students answered a given question, the system gave them an explanation based on their experimental group, and students then self-reported their levels of anxiety during the process. To analyze the results, the researchers did an Analysis of Variance or ANOVA to compare the means of multiple independent and dependent variables.

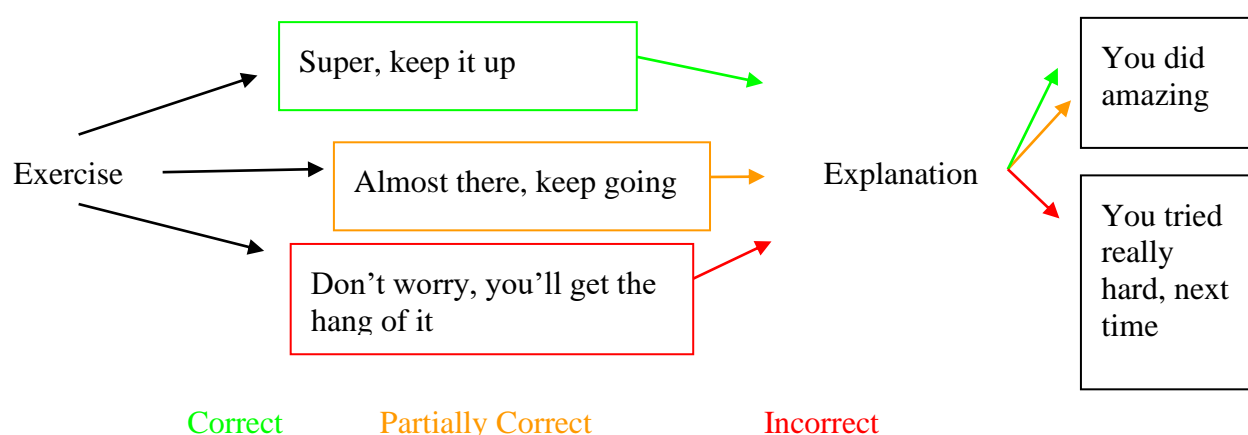


Figure 1. Shows a sandwich feedback model

The second study aimed to figure out the true effectiveness of the different types of animated agents— either text, voice, or agent— using a classroom setting of 61 students with 3 groups (animated agent, voice agent, and no voice or animated agent). In this design, students were split by gender, and then randomly assigned to one of the three groups as equally as possible. In the control group, there were 11 boys and 10 girls, while every other group consisted of 10 boys and girls. Over the course of 29 assignments, students in the three groups were tested on an increase or decrease in self-efficacy. After the completion of all the assignments, a post-test was given to see how much the students learned (Van Der Meij et. al 2015). At the end of the experiment, ANOVA tests— where the gender and group fixed agents were fixed condition— were done to compare how students fared on the assignments and tests as the course progressed to see how well animated agents improved scores.

Results

In the first experiment, four main evaluations were used. For the first evaluation, researchers measured mean anxiety across the different modalities and types of feedback, which showed no overall effect. For the second evaluation, they measured mean anxiety across the feedback types depending on the performance of the learner (correct, incorrect, partially correct), which showed a few results. For the third evaluation, they measured mean anxiety across gender, feedback modality, and feedback type; the interactions among them were proven to be

significant, conveying that gender had a main effect on the anxiety levels that are felt when learning a foreign language. To further examine this, the researchers had a fourth evaluation, in which they measured mean anxiety for males and females separately across the six conditions; they found significant effects.

For the second experiment, which revolved around the effectiveness of animated agents, it was seen that through the use of animated agents, students were reporting higher levels of confidence and knowledge while also reporting lower levels of anxiety associated with learning something new. There was statistical significance when referring to three main ideas: time, condition, and gender. Over time, for males, it was seen that in the control group, self-efficacy increased while in the experimental group, it decreased over time. On the other hand, it was the opposite for females, where experimental groups reported higher levels of self-efficacy, and lower levels were reported as time spent in the control group increased (Van Der Meij et. al 2015). However, the gender of motivational agents does influence the comfortability exerted by students, thus leading to better scores (Armando 2022).

Group	Boys Before Exp.	Boys After Exp.	Girls Before Exp.	Girls After Exp.
Agent	5.25	7.00	~4.20	~5.80
Voice	~5.30	~5.60	3.25	~5.10
Control	6.30	7.50	3.75	5.25

Figure 2. Shows the distribution of self-efficacy rating over the experiment

When asked to rate the model, in comparison to the midpoint, it was seen that there was a gap of one standard deviation between the rating of the animated agents. More specifically, the boys tended to rate 0.5 standard deviations below while girls tended to rate 0.5 standard deviations above.

Discussion and Conclusion

The researchers reached many conclusions from their examinations. For females, they found that while feedback modality and type did not have a significant relation, the mode of feedback alone had a notable impact: the highest levels of Foreign Language Anxiety came from text and then voice, with the lowest levels coming from animated agents (Ismail p. 205). Males, on the other hand, had more of a noticeable relationship with feedback type and mode's effects on anxiety levels. Furthermore, the researchers noted that the type of feedback (motivational or explanatory), did not have an overall impact on FLA. That's because both types only explained why the right answer was right, so people who chose the wrong options did not dwell on them or feel anxious about it. For feedback modality, there was no observable impact on the levels of FLA except in the presence of other factors (Ismail, p. 205). The highest levels of anxiety occurred in people who answered incorrectly and got explanatory feedback, while the lowest levels of anxiety occurred in people who answered correctly and got explanatory feedback; this was significantly less than the people who answered correctly and got supportive feedback (Ismail p. 205). This suggests that supportive feedback is effective if used fittingly; students answering correctly feel as if they are not performing well enough when they receive such feedback, increasing their anxiety levels. Biologically, males and females differ in their higher-order functions, and thus in their learning styles and cognitive ability (Taghinezhad p. 419). Therefore, researchers recommend studying the relationship between gender and FLA to create better-suited learning environments for all. For instance, females in this study became less stressed when working with an agent, and males required text-based explanatory feedback (as opposed to text-based supportive) to feel more at ease (Ismail p. 205). Applying these findings to classrooms and teaching practices would pose large-scale benefits,

The research in this article could have many potential implications. For example, it seems as if the use of pedagogical agents for motivation influences females more than it does males, providing them with a heavier boost in confidence regarding their skills. This advancement in the use of motivational agents could be extended to other areas of education, such as public speaking. Motivational agents aim to reduce students' lack of faith in their abilities, and in some cases improve the skill altogether. However, pedagogical artificial intelligence systems can always be improved to factor in the mindset of the student, and doing so can lead to the modification of school curriculums, creating a more proficient education for students. This will allow for the widespread use of motivational agents, which can help benefit the learning rates of all students. Due to the nature of these motivational agents, a few modifications—which regard special circumstances—can help increase the learning potential of special education students. Furthermore, other research done on motivational agents suggests that their overall benefit goes further than increasing scores, as they also influence behavior (Figen 2007). Based on the research presented in the article, the future looks promising for the development of AI to help bridge the language barrier and create a more adaptive and interactive system for all.

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Sustainable agriculture is a stimulator to stretch out sustainable development goals

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Abstract

Sustainability is a universal call to protect the planet and people to enjoy peace and prosperity. To ensure sustainable development goals, Sustainable agriculture should be practiced as it serves as a base for Sustainable Development Goals. It induces the researchers to assess whether sustainable agriculture is a stimulator to stretch out Sustainable development goals. The Primary data collected from 132 farmers within Tenkasi district. The opinion and the correlation of sustainable agriculture association with sustainable development goals were analyzed using Weighted average score and Structural Equation Modeling. The influence of sustainable agriculture with sustainable development goals was tested using regression analysis. The result revealed that SDG's goal has high correlation with sustainable agriculture. It is understood that if sustainable agriculture is practiced in a full-fledged mode then it is easy to attain Sustainable Development Goals within the year of 2030.

Key Words: Sustainable Agriculture, stimulator, Sustainable Development Goals.

Introduction

சுழன்றும்ஏர்ப் பின்னது உலகம் அதனால்

உழந்தும் உழவே தலை

Wherever it whirls, the world must follow the farmer.

Despite of hardships farming is the best.

Thiruvalluvar

In this world with emerging population, it is necessity to meet the needs of present without compromising the standard of living of the future generation by sustaining resources. The need of sustainable resource management is increasingly urgent. Thus keeping it in mind, the United Nations Organization has announced the Sustainable Development Goals that is to be achieved by the year 2030¹. All those SDG's have deep connection with agriculture and agriculture has been a conversation around the globe as it comprises world economy, human society and biodiversity within it.

The 9th London International Conference also took part in the conversation along with the globe by providing a chance to address on the topic "Humanities and Social Sciences" The humanities and social sciences are the study of human behavior and interaction with social, cultural, environmental, economic and political contexts. This will provide a broad understanding of the world in which we live, and how can we act as a responsible and informed citizens to create more just, equitable and peaceful society.

Statement of the Problem

Tenkasi district is one of the prominent agriculturist districts among southern districts where cropping Pattern varies from Taluk to Taluk. Factors such as type of soil, climate conditions, irrigation facilities determines the cropping pattern. Managing those resources in an effective way is what that matters most in agriculture. Due to the climate change, decrease in ground water level and soil fertility, agricultural sector is facing a controversy. Moreover, in the 2022 Global Index of SDGs, India ranked 121 out of the 163 countries². With seven years left to meet the global goals on sustainable development, India is in off-track. Thus, to bring India on track, it is necessary to bring changes in agriculture through sustainable practices. To ensure SDG's it is necessary to invest in sustainable agriculture as it gives equal weight to environmental, social, and economic concerns.

This induces the researchers to think critically to answer the following question

- Is Sustainable Agriculture act as a stimulator to stretch out Sustainable Development Goals?

Objective of the study

The objective of this study is

- To assess the opinion of farmers on the statement - "Sustainable Agriculture is a Stimulator to Stretch out Sustainable Development Goals"

- To estimate how far sustainable Agriculture associated with Sustainable Development goals on the basis of opinion of farmers.
- To test how Sustainable Agriculture influence Sustainable Development Goals from the perspective of farmers.

Literature review

A review of previous studies on Sustainable Development Goals highlights the traits of perception of youth and agriculturist towards Sustainable Development goals. The main conclusions of some earlier studies are given below.

Dr.Somanchi Hari Krishna, Dr. G.IIankumaran, Dr.C.Balakrishnan, Dr.Kailas Aute, Dr.Surekha Rohidas Patil (2022)³ handled a study on “Knowledge, perception and awareness about Sustainable Development Goals among students of Indian Public University” have concluded that for a better and sustainable future the objective of sustainable development goal should be focused on and students opined that decent Labour and economic growth , partnership for goals and responsible consumption and institutions are the three least sustainable development goals.

Balamuralithra Balakrishnan, Fumiihiko Tochinai & Hidekazu Kanemistu (2019)⁴Conducted a study on “Perception and attitudes towards sustainable development among Malaysian Undergraduates” has been reported that higher education institutions plays a critical role in promoting sustainable development and developing a future workforce who maintains a sense of responsibility towards sustainable development that will ensure the next generations will able to live a quality life in an environment conducive to comfort and safety.

Shabana Anjam and Md. Tarique (2017)⁵ published an empirical study on “Agriculture and poverty reduction in India” with a aim to find a relative impact of GDP growth on agriculture and non - agricultural sector on poverty reduction in India. The result of the study indicates that there is a need to restructure, resurrect and transform our agriculture sector so that it can able to meet the growing challenges and can realize its full potential

Adeola, R.G. and Adetunbi, S.I (2015)⁶ on their study “Farmers perception of sustainable agriculture in South- Western Nigeria: Implications for rural economy” examined that farmers were favorably disposed to the practice of sustainable agriculture and realized its potential as an alternative to industrial agriculture, a profitable venture and a capability of providing a healthy family that would improve rural economy.

Tutu felix, Boamah Darkwa and lawerence Amponasah (2013)⁷ has inducted a study on “Attitude towards sustainable agricultural: A survey of agricultural science students in Sunyani Polytechnic, Ghana, West Africa” examines that the respondents have positive attitude towards sustainable development and believes that sustainable agriculture can protect agriculture and environment. The study suggests that more education and training must be given to farmers so that they can adapt sustainable agricultural practices.

A large number of researches have been conducted on sustainable development goals and sustainable agriculture with reference to geographical locations in India and abroad. Till date,

none of the studies has bridged the gap between all seventeen sustainable development goals with sustainable agriculture especially in the perspective of the master eye – the farmers.

Scope of the study

The following are the scope of the study

Geographical Scope

The study covers the farmers in Tenkasi District which is located in the Southern District of Tamil Nadu, India.

Analytical Scope

This study tries to attain its objectives by analyzing the opinion of farmers on the statement “Sustainable Agriculture is a Stimulator to Stretch out the Sustainable Development Goals”. Besides, it also attempts to find out the association and influence of sustainable Agriculture with Sustainable Development Goals.

Functional Scope

By highlighting Sustainable Agriculture association with Sustainable Development Goals, this study acts a reminder that the **local action** on practicing sustainable agriculture will guide towards the **global action** of Sustainable Development Goals.

Linkage of Sustainable Development Goals with Sustainable Agriculture

The attitude of farmers towards the linkage of Sustainable development goals with sustainable agriculture were collected through Likert five- point scale, Strongly Agree (SA), Agree (A), Neutral (N), Disagree (DA), and Strongly Disagree (SDA). The responses were converted into scores by giving 5 points for strongly agree, 4 for agree, 3 for neutral, 2 for disagree and 1 for Strongly disagree for the positive statement and vice versa. Seventeen sustainable goals statement in linkage with Sustainable agriculture are given to the respondents to obtain the opinion about the linkage of SDG's goal with sustainable agriculture. The statements and the number of respondents who have strongly agreed, agreed, neutral option, disagreed and strongly disagreed statements were given in the following table 1.1.

Table 1.1
Opinion of Farmers on the Statement “Sustainable Agriculture act as a Stimulator to Stretch out Sustainable Development Goals”

Statements	Opinion					WAS
	SA	A	N	D	SD	
SDG 1 - No Poverty Sustainable Agriculture will boost rural income and helps to alleviate poverty	60 (300)	32 (128)	17 (51)	9 (18)	14 (14)	511
SDG 2 - Zero Hunger Sustainable Agriculture provides safe, nutritious and sufficient food all year around	73 (365)	40 (160)	10 (30)	7 (14)	2 (2)	571
SDG 3 - Good Health and Well being Sustainable Agriculture will address the nutritional needs to adolescent girls, pregnant and lactating women, and older persons.	45 (225)	42 (168)	20 (60)	12 (24)	13 (13)	490
SDG 4 - Quality Education Agricultural extension enables farmers to access to the skills, tools, inputs and knowledge they need to thrive.	28 (140)	29 (116)	25 (75)	34 (68)	16 (16)	415
SDG 5 - Gender Equality Equal access of resources between men and women can boost agricultural output.	12 (60)	20 (80)	17 (51)	47 (94)	36 (36)	321
SDG 6 - Clean Water and Sanitation Sustainable Management of water in agriculture ensures availability and sanitation for all.	35 (175)	29 (116)	38 (114)	8 (16)	22 (22)	443
SDG 7 - Affordable and Clean Energy Sustainable Agriculture will helps to reduce the dependent on nonrenewable source of energy.	22 (110)	28 (112)	32 (96)	18 (36)	32 (32)	386
SDG 8 - Decent Work and Economic Growth Agriculture is an engine for economic growth and employment	29 (145)	38 (152)	27 (81)	22 (44)	16 (16)	438
SDG 9 – Industry, Innovation and Infrastructure Sustainable Agriculture promote resilient infrastructure, sustainable industrialization and foster innovation.	19 (95)	10 (40)	13 (39)	43 (86)	47 (47)	307
SDG 10 – Reduced Inequalities Sustainable agriculture will give equal weight to environmental, social and economic concerns thus helps to reduce inequalities.	28 (140)	19 (76)	35 (105)	27 (54)	23 (23)	398
SDG 11 – Sustainable cities and Communities Sustainable Agriculture enhance sustainable human settlement planning and Sustainable Management	12 (60)	27 (108)	22 (66)	30 (60)	41 (41)	335
SDG 12 – Responsible Consumption and Production Sustainable Agriculture prevents the exploitation of soil, Water and other resources.	41 (205)	29 (116)	27 (81)	14 (28)	21 (21)	451
SDG 13 - Climate Action Climate start agriculture helps to guide actions to transform agri-food systems towards green and climate resilient practices	45 (225)	27 (108)	30 (90)	14 (28)	16 (16)	467

Sustainable Agriculture is the stimulator to stretch out Sustainable Development Goals.

SDG 14 – Life below Water Sustainable Agriculture prevents water contamination and manages water resources.	32 (160)	14 (56)	35 (105)	29 (58)	22 (22)	401
SDG 15 – Life on Land Sustainable Agriculture will induce Eco-citizenship	42 (210)	34 (136)	29 (87)	12 (24)	15 (15)	472
SDG 16 – Peace, justice and strong institutions Sustainable Agriculture enables citizens to defend their land and resource rights and to engage in environmental advocacy in a nonviolent manner and without fear of intimidation or reprisal	18 (90)	17 (68)	22 (66)	35 (70)	40 (40)	334
SDG 17 – Partnerships for the goals Sustainable Agriculture goals can be achieved with partnership with public sectors, NGO and financial institutions.	8 (40)	12 (48)	26 (78)	48 (96)	38 (38)	300

(SA – Strongly Agree, A – Agree, N –Neutral, D-Disagree, SD – Strongly Disagree , WAS – Weighted Average Score)

Table 1.2

“Sustainable Agriculture is a Stimulator to Stretch out Sustainable Development Goals”- Weighted Average Score from Farmers Perspective.

S. No	Goals	Weighted Average	Mean	Rank
1	No Poverty	511	3.87	II
2	Zero Hunger	571	4.33	I
3	Good Health and Well being	490	3.71	III
4	Quality Education	415	3.14	IX
5	Gender Equality	321	2.43	XVI
6	Clean Water and Sanitation	443	3.37	VII
7	Affordable and Clean Energy	386	2.92	XII
8	Decent Work and Economic Growth	438	3.32	VIII
9	Industry, Innovation and Infrastructure	307	2.33	XIII
10	Reduced Inequalities	398	3.02	XI
11	Sustainable cities and Communities	345	2.61	XIV
12	Responsible Consumption and Production	451	3.42	VI
13	Climate Action	467	3.54	V
14	Life below Water	401	3.04	X
15	Life on Land	472	3.57	IV
16	Peace, justice and Strong institutions	334	2.53	XV
17	Partnerships for the goals	300	2.27	XVII

Source: Field Data

Neutral Score (132*3= 396)

Table 1.2 indicates that the sustainable goal “Zero Hunger” has more weighted average score than other goals. This clearly states that goal zero hunger has high correlation with sustainable agriculture. The possible reason for this may be the food which is necessity for the anyone’s survival and farmers were the responsible producers to satisfy the basic need of humans.

Moreover, Farmers attitude correlates well with our famous Tamil poet Bharathiyar words “Thani oru manithanuku unavillai ennai, Jagaahinai Azhithiduvom” which means if a single person does not have food, then we will destroy this whole world where jagam has two meanings, world and farms respectively. The goal “No Poverty” has second highest weighted average score as agriculture is a prominent force in reducing poverty followed by the third highest weighted average score “Good Health and well being” which stress us that food is medicine. The fourth highest weighted average score was given to “Life on Land” which indicates soil is the most important resource in agriculture without which soil from toil in agriculture is impossible. The fifth score was given to “Climate action” which stresses that partnership with climate leads to a profitable venture. The sixth weighted average score was given to “Responsible consumption and Production”. The seventh weighted average score was given to “Clean water and sanitation”. The eighth weighted average score was given to “Decent work and economic growth”. The neutral score was given to “Quality education” which shows traditional farm tools and education as a powerful tool act as a two side of the same coin in agriculture. “Life below water” and “Reduced inequalities” scored tenth and eleventh weighted average score respectively. All those above Sustainable Development goals are higher than the neutral score, thus having high correlation with sustainable agriculture. But the score is given to the “Affordable and clean energy”, “Industry, Innovation and Infrastructure”, “Sustainable cities and communities”, “Peace, justice and strong institutions”, “Gender equality”, “Partnerships for the goals” are less than the neutral score which may be the reason that farmers were conventional and self determined.

Figure 1
Sustainable Agriculture association with Sustainable Development Goals.

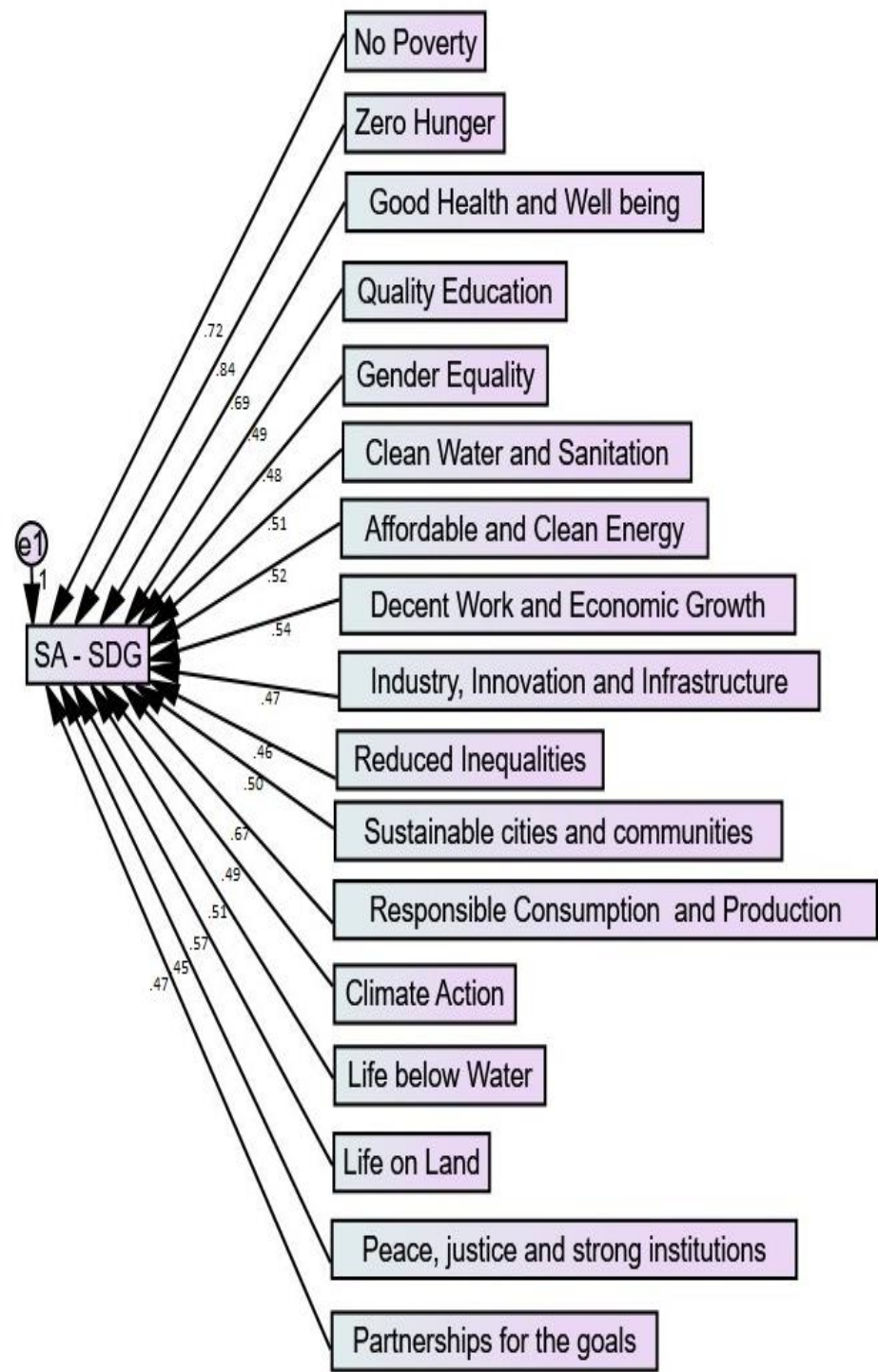


Table 1.3

Standardized Estimates for the relationship between sustainable Agriculture and Sustainable Development Goals on the basis of farmers opinion

Dependent Variable		Independent Variable	Standardized Estimate	Sig. (p – Value)	Result (H ₁ Accepted / Rejected)
Opinion	←	No Poverty	0.72***	.000	Accepted
Opinion	←	Zero Hunger	0.84***	.000	Accepted
Opinion	←	Good Health and Well being	0.69***	.000	Accepted
Opinion	←	Quality Education	0.49***	.041	Accepted
Opinion	←	Gender Equality	0.48***	.052	Accepted
Opinion	←	Clean Water and Sanitation	0.51***	.020	Accepted
Opinion	←	Affordable and Clean Energy	0.52***	.002	Accepted
Opinion	←	Decent Work and Economic Growth	0.54***	.032	Accepted
Opinion	←	Industry, Innovation and Infrastructure	0.47***	.048	Accepted
Opinion	←	Reduced Inequalities	0.46***	.022	Accepted
Opinion	←	Sustainable cities and communities	0.50***	.038	Accepted
Opinion	←	Responsible Consumption and Production	0.67***	.000	Accepted
Opinion	←	Climate Action	0.49***	.000	Accepted
Opinion	←	Life below Water	0.51***	.002	Accepted
Opinion	←	Life on Land	0.57***	.000	Accepted
Opinion	←	Peace, justice and strong institutions	0.45***	.010	Accepted
Opinion	←	Partnerships for the goals	0.47***	.023	Accepted

***Significant at 0.05 Level

The standardized regression estimates of opinion about sustainable agriculture linkage with sustainable development goals are shown in Table 1.3 that Zero hunger (0.84, $p = 0.000$) is found to deep connection with the sustainable agriculture and totally six SDGs goals are highly linkage with the sustainable development goals. The path weights explicit that all the seventeen Goals are significant at $p < 0.05$. Hence the hypothesis Ha, the sustainable agriculture is positively influence the Sustainable Development Goals.

Table 1.4

Model Summary-Influence of Sustainable Agriculture with sustainable development goals from farmers opinion

Model	R	R square	Adjusted R Square	Std.Error of the Estimate	Change Statistics				Sig.F Change
					R Square Change	F Change	df 1	df 2	
1	.955 ^a	.913	.900	.123	.913	70.075	17	114	.000

a. Predictors: (Constant), Partnerships for the goals, Zero Hunger, Clean Water and Sanitation, Industry, Innovation and Infrastructure, Good Health and Well being, Quality Education, Sustainable cities and communities, Affordable and Clean Energy, Gender Equality, Decent Work and Economic Growth, Life on Land, Climate Action, Life below Water, Peace, justice and strong institutions, No Poverty, Responsible Consumption and Production, Reduced Inequalities

b. Dependent Variable: SA – SDG

Table 1.4 reveals that R value was 0.955. It measures the degree of relationship between the sustainable agriculture and the sustainable development goals (17 Goals). R Square value was 0.913. It means that about 91% of the deviation in sustainable agriculture is analyzed by seventeen independent SDGs. Adjusted R-Squared value was 0.900. It adjusts the statistic based on the number of independent variables in the model. It shows the fitted model is good. Durbin – Watson (DW) statistic shows 1.143. It indicates no auto correction in the analysis. F value was 70.075 and p value was significant at 95% level. Hence there is significant relationship between the dependent and independent variables.

Findings

1. Farmers opinion towards sustainable Agriculture in association with Sustainable Development Goals

The Farmers opined that all the seventeen Sustainable Development Goals linked with agriculture but the level of correlation varies from high to low (0.84 to 0.45).

2. Correlation of Sustainable agriculture with Sustainable development goals

The goal Zero Hunger have high correlation with Sustainable agriculture ($0.75 \geq$ Standardized estimate). Goals like No poverty, Good health and wellbeing, Life on land, Climate action, Responsible production and consumption, Clean water and sanitation, Decent work, Economic growth, Quality Education and Life below water have moderate correlation with sustainable agriculture ($0.75 \leq 0.5$) respectively. SDG's like Reduced inequalities, Affordable and clean energy, Industry, Innovation and Infrastructure, Sustainable cities and communities, Peace, justice and Strong Institutions, Gender Equality and partnership for goals have low correlation with Sustainable Agriculture ($0.5 \leq$ Standardized estimate) respectively.

Influence between Sustainable Agriculture with Sustainable Developments Goals.

The prediction model is statistically significant with $F=70.075$, $p<0.001$. Further, it accounts for 95% of the variance on the influence of Sustainable Agriculture with Sustainable Development Goals.

Suggestions

The following suggestions are emanated from the findings of the study.

SDG 5: Gender Equality

- Monetary support can be given to women farmers in order to encourage them to enter in the field of agriculture.

SDG 7: Affordable and Clean Energy

- Awareness related to crop residue management utilization of agriculture wastages in the construction can support renewable source of energy.

SDG 9: Industry, Innovation and Industry Infrastructure

- Engagement of youth leads to innovation in Agri entrepreneurship. Thus, it can extend helping hands to farmers.
- Subsidy can be provided on Green House farming that can lead a profitable farming and can cope up with unfavourable weather.

SDG 11: Sustainable cities and communities

- Encouragement of urban agriculture will help to promote sustainable cities and commodities and helps to promote the sense of responsibility to people other than farmers.

SDG 17: Partnership for the Goals

- More Training and Education can be given to farmers about Sustainable Agricultural Practices.
- The Government can build the partnership with farmers to create the common market for the agriculture products.

Conclusion

This study ensures that if farmers Practices sustainable agriculture then the sustainable development goals can be achieved automatically. Thus, Sustainable agriculture is acting as a stimulator to stretch out Sustainable Development goals. It is not only a responsibility of the farmers but also the responsibility for every citizen to protect our mother Earth and to inherent the social responsibility. If the urgent call of sustainability is not answered then it will be difficult to live and thrive. Let us stand together to create a sustainable future so that we can leave no one behind.

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Covid 19 Impact on Families

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Abstract

The COVID-19 pandemic has had a significant impact on families worldwide. The virus has spread rapidly, leading to lockdowns and social distancing measures to slow its spread. These measures have led to job losses, economic uncertainty, and financial stress for many families. Additionally, the closure of schools and other educational institutions has led to challenges in providing education and childcare. The isolation and social distancing measures have also led to mental health concerns, particularly for children and young people. This literature review study aims to provide a comprehensive overview of the impact of COVID-19 on families, with a focus on the unique challenges that they face during this pandemic.

Keywords: COVID-19, family, children, mental health, education, isolation

1. Introduction

The COVID-19 pandemic is a global health crisis caused by the novel coronavirus. The virus, first identified in Wuhan, China in 2019, has spread rapidly and has affected nearly every country in the world (He et al. 2020; Srivastava et al.2020). It primarily spreads through respiratory droplets and symptoms can range from mild to severe.

The COVID-19 pandemic has drastically changed the lives of people all over the world, and families have been particularly affected by the pandemic (Adisa et al. 2021; Yavorsky et al. 2021). The virus has spread rapidly, leading to lockdowns and social distancing measures to slow its spread. These measures have led to job losses, economic uncertainty, and financial stress for many families (Blanco et al. 2022; Chung et al. 2022). Additionally, the closure of schools and other educational institutions has led to challenges in providing education and childcare. The isolation and social distancing measures have also led to mental health concerns, particularly for children and young people (Fegert et al. 2020).

The pandemic has had a significant impact on families. Many countries have implemented lockdowns and social distancing measures to slow the spread of the virus, which has forced many businesses to close, and many people to lose their jobs (Panneer et al. 2022). This has led to economic uncertainty and financial stress for many families (Yavorsky et al. 2021). Furthermore, schools and other educational institutions have closed, leading to challenges in providing education and childcare. The isolation and social distancing measures have also led to mental health concerns, particularly for children and young people.

In this article, it will be examined the various ways in which the COVID-19 pandemic has affected families and the unique challenges they are facing during this crisis. It will be also explored some strategies that families can use to cope with these challenges and ways in which they can support each other during this difficult time.

2. The methodology

The methodology section of this literature review aimed to identify and synthesize existing research related to the impact of COVID-19 on families.

The inclusion criteria for articles were studies that focused on the impact of COVID-19 on families, including parents, children, and other family members. Reviews were independently screened the titles and abstracts of the identified articles for eligibility. Data were extracted from the included studies, including the study design, sample size, demographic characteristics of participants, and key findings related to the impact of COVID-19 on families.

The results of the literature review were synthesized narratively, focusing on the key themes related to the impact of COVID-19 on families, including economic stress, educational challenges, and mental health concerns.

3. Reasons for Keeping Youngsters at Home

The schools have been one of the gathering places in the society. To control the spread of infection in public places, schools have been closed, and young people in the education system have stayed at home (Tadesse & Muluye, 2020). It is crucial to keep youngsters at home during the COVID-19 pandemic for the sake of public health. The virus is primarily transmitted through respiratory droplets, and young people can carry it without displaying symptoms (Hadaway, 2020; Leung et al. 2020). By keeping them at home, the risk of them contracting and spreading the virus to vulnerable individuals such as the elderly or those with underlying health conditions is reduced.

In-person activities and gatherings pose more risks, especially for young people who tend to engage in social activities. This can lead to a higher risk of exposure to the virus. By keeping them at home, the risk of exposure is significantly reduced, and the potential for exposure at school or extracurricular activities is eliminated (Psaki et al. 2022). The virus spreads primarily through respiratory droplets, which can easily be transmitted through close contact with infected individuals.

Classrooms in schools, where students are near each other, present a particular risk for the spread of the virus. This risk is even greater in situations where physical distancing is difficult to maintain (Li et al. 2023). Moreover, students who travel to school on buses or other forms of transportation may be at risk due to close proximity to others during transit.

Sports and physical activities, which involve close contact with others in shared spaces such as locker rooms, bathrooms, and common areas in schools, can also increase the risk of exposure to the virus. These activities increase the chance of contact with contaminated surfaces or proximity to infected individuals (Salonen et al. 2023).

The government and health officials have advised maintaining social distancing and avoiding unnecessary social contacts (Klinenberg & Leigh, 2023). Keeping youngsters at home is one way to achieve this goal.

4. Challenges of Keeping Youngsters at Home

Keeping youngsters at home during the COVID-19 pandemic can be challenging for families. Youngsters may find it difficult to cope with the lack of social interaction with their peers and may miss the companionship and interaction that they would typically have in a school or extracurricular setting (Sberna, 2023; Winfield et al. 2023). Remote learning can also be challenging, especially for those who require hands-on learning experiences or in-person instruction. Also, some families may not have access to reliable internet or devices for online learning.

The isolation and uncertainty caused by the pandemic can have a negative impact on the mental health of youngsters. They may experience stress, anxiety, or depression due to the changes in their daily routines and social lives (Maljaars et al. 2023; Minervini et al. 2023). Limited opportunities for physical activity can also be detrimental to their physical and mental health. Keeping youngsters at home can also place a significant burden on parents who may be juggling work and childcare responsibilities while dealing with their own stress and uncertainty related to the pandemic. It may also cause financial strain on families, particularly if one or both parents are unable to work due to the pandemic.

To mitigate these challenges, families can explore alternative ways to promote social interaction for youngsters, such as virtual playdates or online clubs. Parents can also work with schools and educators to ensure that remote learning is effective and accessible for their children (Lane, et al. 2023). Furthermore, families can prioritize physical activity and encourage outdoor activities while adhering to public health guidelines. It is important to acknowledge the challenges and seek support when needed to help youngsters and families navigate this unprecedented time.

It is important for families to find ways to address these challenges and support one another during this difficult time. This may include seeking support from community resources, finding creative ways to stay connected with friends and family, and prioritizing self-care and mental health.

5. Strategies for Coping with Home-Based Care

The COVID-19 pandemic has caused many families to face the challenge of caring for their children at home, which can be stressful and demanding. To cope with this, it's important to establish a daily routine that provides structure and normalcy. This routine can include fixed times for meals, learning, and leisure activities. Creating a dedicated workspace for learning and work can help to separate work and play activities, making it easier to focus (Kurt, 2015). Families should prioritize self-care, including activities like exercise, meditation, and relaxation. Staying connected with friends and loved ones through virtual means, such as video calls, social media, and text messaging, can also help. Fun activities like playing games, watching movies, or cooking can be enjoyed together as a family (Shannon, 2023). It's important to maintain a positive attitude and try to find the good in difficult situations. Families can seek support from community resources, such as mental health professionals and support groups (Furudate et al. 2023). Lastly, families should remain flexible and adaptable as the situation is ever-changing.

It is also important for families to remember that it is normal to feel stressed and overwhelmed during this time, and to be kind and patient with themselves and others. By implementing these strategies, families can better cope with the challenges of home-based care during the pandemic.

5.1. Limited social interactions and potential for isolation

The COVID-19 pandemic has resulted in limited social interactions and potential for isolation for families. Physical distancing measures, recommended by governments and health organizations to slow the spread of the virus, have resulted in the closure of public spaces such as schools, extracurricular activities, and community centers (Kim, 2020). This has greatly limited opportunities for social interactions for families. Also, remote learning for youngsters has further limited their chances to interact with peers, while many adults working from home have also experienced reduced opportunities for social interactions with colleagues and friends. Moreover, travel restrictions implemented by many countries have made it difficult for families to visit loved ones or travel for work or leisure. The fear of contracting the virus may also discourage some families from engaging in social interactions, further limiting their opportunities (Roberto et al. 2021). Even if public places are open, they

often have limited capacity and stringent safety measures, which can make it challenging for families to engage in social interactions.

These factors can lead to feelings of isolation, loneliness, and depression for families, which can have a negative impact on their mental and emotional well-being. It is important for families to find ways to stay connected with friends and family during this difficult time, such as through virtual meetings and social media (Kurt, 2023; Nascimento, et al. 2023; O'Keeffe & Clarke-Pearson, 2011).

Families can also find ways to engage in activities that promote social interactions, such as joining online communities, participating in virtual events, or organizing small gatherings with safety measures in place. Additionally, they can also seek support from community resources, such as mental health professionals and support groups.

5.2. Utilizing online resources for education and socialization

Utilizing online resources for education and socialization can be a valuable tool for families during the COVID-19 pandemic, as it allows children to continue learning and interacting with others while staying at home. Many schools and educational institutions have shifted to online learning platforms like Google Classroom or Zoom to continue providing instruction to students (Chipamaunga et al. 2023). Virtual museum tours and field trips are also being offered by many museums, zoos, and cultural institutions, allowing students to explore and learn from home. Educational apps and games can be used as supplements for learning and to keep children engaged. Online tutoring services are also available for students. Social media and video conferencing platforms like Facebook and Zoom can be used by families to stay connected with friends and loved ones, and to participate in virtual social activities. Additionally, families can join online communities and forums to connect with other families who are facing similar challenges with home-based care during the pandemic.

It is important for families to monitor their children's online activities and to set limits on screen time. It is also important to note that online resources should be used as a supplement rather than a replacement for in-person interactions and learning.

5.3. Managing stress and maintaining mental health

Managing stress and maintaining mental health is crucial for families during the COVID-19 pandemic. The unprecedented change, uncertainty, and isolation brought on by the pandemic can take a toll on mental health. For managing stress and maintaining mental health for families during the COVID-19 pandemic, acknowledging and expressing feelings of stress, anxiety, and sadness is important during difficult times (Kumar & Nayar, 2021).). This can be achieved through activities like journaling, talking to a therapist, or discussing with loved ones. It is also crucial to practice self-care, including activities like exercise, meditation, and relaxation, which should be prioritized by families (Lewis & King, 2019; Mavridis et al. 2019). Establishing a daily routine can also help create structure and a sense of normalcy, by setting regular times for meals, learning, and leisure activities. Staying connected with friends and loved ones is important and can be done through virtual means like video calls, social media, and text messaging. If feelings of stress, anxiety, or depression persist, seeking professional help, such as consulting a mental health professional or joining a support group, may be necessary. Moreover, families can explore new activities and ways of connecting with

others, like online fitness classes, virtual game nights, and community-building initiatives. Finally, it is vital to seek support from community resources, like mental health professionals and support groups, if needed.

It is important to remember that it is normal to feel stressed, anxious or overwhelmed during this time, and that it is important to take care of one's mental health. It's also significant to recognize that everyone's needs are different and that it's important to find what works best for each individual and family.

6. Discussion and Conclusion

Keeping youngsters at home during the COVID-19 pandemic is a challenging task, and it's vital that families are supported and understood throughout this difficult time. Communities, educators, and employers should take an active role in providing support and resources to families and ensuring that they have the information and tools they need to navigate this unprecedented situation.

The COVID-19 pandemic has had a significant impact on families, with many facing extraordinary challenges. They navigate the complexities of balancing work and home responsibilities, providing adequate supervision and education for their children, and managing stress and maintaining mental health (Guy & Arthur, 2020; Schultheiss, 2006). The need for support and understanding for families during this time is crucial.

It's important to remember that families are dealing with a lot of uncertainty, and clear and accurate information about the pandemic and any measures that are being taken to control it are essential for them to make informed decisions about their well-being. Communities, educators, and employers should take an active role in providing support and resources to families and ensuring that they have the information and tools they need to navigate this unprecedented situation.

Moreover, it's important for families to take care of their mental and physical health, and to find ways to stay connected with loved ones, even if it's remotely. They can also explore online resources for education, and socialization, and set routines and schedules to help them cope with home-based care.

In these challenging times, it's important to remember that families are not alone and that there is help available. It is essential that the society all comes together to support families and help them navigate this difficult time. Together, the society can get through this pandemic, and comes out stronger on the other side.

Keeping youngsters at home during the COVID-19 pandemic is important for several reasons. One of the main reasons is to reduce the spread of the virus. Young people can be carriers of the virus and may spread it to vulnerable populations such as older adults and those with underlying health conditions. Additionally, in-person activities and gatherings can increase the risk of exposure to the virus.

Another reason to keep youngsters at home is to support the efforts of healthcare professionals and public health officials. By staying home, families can help to reduce the

burden on the healthcare system and allow healthcare professionals to focus on treating those who are most in need.

It is also important to keep in mind the challenges and difficulties that families may face during this time. These include difficulty in balancing work and home responsibilities, limited social interactions and potential for isolation, difficulty in providing adequate supervision and education, and managing stress and maintaining mental health.

Strategies for coping with home-based care, such as setting routines and schedules, utilizing online resources for education and socialization, and managing stress, can help families navigate these challenges.

Overall, keeping youngsters at home during the COVID-19 pandemic is crucial for protecting public health, supporting healthcare professionals, and helping families navigate the challenges of the pandemic.

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The role of European Union values in the Ukrainian social-humanitarian safety provision system

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Abstract

The article aims to analyze the role of European Union values in providing a social-economic and humanitarian safety provision system in Ukraine. The research methods include descriptive analysis, an interdisciplinary approach integrated into the different analytical fields, and the range of humanitarian safety perspectives they bring to bear on a certain topic, theme, or issue in the political, economic, legal, and social sciences estimate. The checked hypothesis is the social-humanitarian safety provision system depends on the process of democratization of society and the functioning of democratic institutions in Ukraine. The democratization of society created the fundament of the social-humanitarian safety provision system. The democratization process depends on the relationship between European values and regional-specific factors in Ukraine.

The social and humanitarian safety provision system in Ukraine closely interconnected with the degree of economic, political, and social transformation, as well as the overall indicators of the market and democratic reforms. The analysis of reforming institutions in Ukrainian and European Union (EU) values and beliefs adoption and adherence defines the key problem of the social and humanitarian safety provision system. The balance of European and regional values directed to the achievement of an acceptable level of the social-humanitarian safety provision system in Ukraine.

The creation of institutions that ensure the acceptable balance formation of European and regional values is an important task for EU integration. The transformation of social-political values to EU values relates to the process of democratization. Social-humanitarian safety provision system depends on the effectiveness of functioning democratic institutions.

Keywords: social-humanitarian safety provision system, European values, regional values, democratization, democratic institutions.

Introduction

The goal of the article is to analyze how the values of the European Union contribute to improving the Ukrainian system and providing humanitarian protection. The checking hypothesis is that the social and humanitarian safety provision system depends on the process of democratization in Ukrainian society. Democratic development is based on functioning social-humanitarian institutions and the creation of the fundamental of a social humanitarian safety provision system. The application of the interdisciplinary approach will allow us to redefine problems outside of normal boundaries and reach solutions based on a new understanding of complex situations and propose directions for solving the problem.

The interdisciplinary methodology combines analysis of humanitarian safety provision systems from various fields of knowledge, integrates knowledge from different fields of sciences, and provides a synthesis of approaches. The legal strategy emphasizes how important international law is in resolving humanitarian problems in regions hit hard by violent conflicts. According to the behavior notion, providing specific knowledge about how people who conduct similarly to them behave can be enough to stop the erosion of norm compliance. Encouragement to appreciate the organic nature of society and people is a major focus of institutional technique. Humanitarian experts who are better able to appreciate human actions or behaviors because of the growth of the ethnocultural component of activity investigate the concept of culture. The practical analysis of European Union values aims and principles represented the implementation of the idea's system for providing humanitarian protection.

By using the following methodology, we may investigate the issue in more detail, spot dangers, and determine what needs to be done to get rid of them. The interdisciplinary technique aims to generalize the intricate knowledge of political, legal, and economic issues and to suggest a thorough examination of the current conflict, its mechanisms, and potential policy interventions.

Literature Review

The notion of humanitarian safety refers to the procedures, guidelines, and measures put in place to safeguard and help those in need, notably those impacted by crises, armed conflicts, or natural disasters. This concept reflects interconnected areas and aspects of humanistic forms of behavior and activity and combines various approaches in social sciences.

The humanistic thinking approach emphasizes the value and potential that each person has at birth and the significance of subjective experiences, self-awareness, and individual choice in determining behavior and well-being. The humanistic worldview starts with giving value to a human being (humanistic thinking) and ends with giving value to all people (human rights.) This approach considers a worldview made by the people for the people. The concepts of "humanistic thinking, rule by law, secularity, democracy, and human rights explain how individuals could develop each of the values step by step. The main tenet of the humanistic

approach to human growth and behavior is that anxiety and suffering are necessary and inevitable elements of the human experience (Leeth, 2011). The followers of the humanitarian concept take into consideration the questions of providing a humanitarian safety provision system, mechanism of prevention threats, strengthening resilience, and human development goals.

The application of legal norms, institutions, and best practices are used to interpret, communicate, and criticize the existing power forces, and provides signals to the humanitarian provision system of inadequate situation in society, and existing threats. Nevertheless, humanitarians work pragmatically there are existing problems due to insufficient tools, and instruments of modern policymakers' application in the decision-making process.

The legal strategy highlights the part played by international law in resolving humanitarian issues in areas hit by severe conflicts. The interdependence and relationship between international human rights law and international humanitarian are discussed by Sivakumaran (2022), who considered that two bodies of law are connected and could be applied when some challenges arise during armed conflict. Kennedy (2016) developed a preliminary model of expertise in proposed experts to be engaged in visible technical and ideological debates and managed the complex boundaries of political and economic life. The author valued legal arrangements, because law consolidates winning, translating victory into right legal entitlements, which are tools and instruments for political and economic struggle. The idea of an interdisciplinary approach in International Relations reveals different paradigms and demonstrates various interdisciplinary concepts. Ashworth (2008) argues that since there are no clear connections between these critical paradigms and the more established paradigms of liberalism and realism, it is still best to refer to International Relations as multidisciplinary because this interdisciplinarity runs counter to the liberal and realist traditions, which hardly ever engage with these approaches.

The discussion debates revealed the institutional approach which focused on understanding institutional responses in situations where military conflicts take place and there is a need of getting a better understanding of forms and methods in humanitarian protection of populations. The institutional methodology emphasizes human appreciation of the organic nature of society and human nature, and efforts keeping in study it as the product of institutional development. One such institution is the market, which is like all the others in that it draws some of its inspiration from human nature, influences human nature in its ways, and is both penetrated by and pierced by all the other institutions that make up the social order (Tugwell, 2023).

Zyberi (2013) gives a broad overview of current institutional structures and responsibility to protect related behaviors. The theoretical and practical issues of the multi-layered nature of protect-related behaviors included obligations, early warning, and assessment capabilities, embedding a culture of accountability, prompt and decisive response mechanisms, and uncertainties.

The cultural concept discussed in the work by Strelnikov (2022) considered the specifics of the ethnocultural component of the professional activity of humanitarian specialists. The formation of the ethnocultural component of activity enables specialists in the humanitarian field to better understand the behavior or activities of people, which are determined by the traditional culture of the ethnic group, have certain discrimination against other people or even danger. The principles and expectations of social interaction are a distinctive feature of spiritual culture. Nosova & Lypov (2022) mentioned the complementary nature of various cultural components that unified all elements into a single whole. They argued that culture could exist as a distinct phenomenon that has developed out of the natural environment and serves reproductive and adaptive purposes.

Levin (2022) ascertains that an interdisciplinary approach comprises cultural specificity, and explores and compares the patterns of behavior prevalent in the post-Soviet space and in other Western and Eastern societies. Since the collapse of the USSR, the author considers that new behavioral stereotypes have been formed in every post-Soviet society, and a significant part of them differ in most new countries, even located exclusively on European territory, but with their cultural characteristics.

Bicciari et al (2022) discussed the relationship between norm violation, norm regulation, and mechanisms that could counterbalance negative effects. The researchers consider that by minimizing the disparity in responses to viewing norm violations and norm regulation, social closeness might stabilize norm compliance. The role of punishment as a crucial social norm stabilizer could be not applied when social proximity encourages imitation of norm compliance. The research proposes giving people specific knowledge about the actions of others who behave similarly to them might be enough to stop the erosion of norm compliance.

The problem of emergency conflicts, the identification of actors, the process of its development, and solutions can be discovered in a few research works. Kennedy (2018) considers the analysis of the global conflict that begins with an identification of the larger scale actors— states, nations, economic classes— and structures— the state system, global capitalism— too often naturalize the actors and structures. After the identification of actors, the most significant work of expertise can be provided.

Roberts (1998) underlines the importance of humanitarianism in reaction to the numerous conflicts wherein racial or religious identity appeared to be the driving force for homicidal violence. The author emphasizes “existing distinctions between Serbs and Croats, Catholics and Protestants, Muslims, and Jews, etc., and the need for tolerance as a foundation for interpersonal relationships. The challenging question of where such humanitarianism leads remains unresolved since it is very difficult to persuade individuals into living together when they harbor intense antipathy toward one another and legitimately fear for their safety.”It raised issues regarding how this system operates and the kind of economic and legal relationships it makes use of. The author pointed out that the nature of such a system is based on the exploitation

of the workers, the rulers, who control all the labor resources and the entirety of the social wealth and unfairly distribute them.

Borchgrevink (2021) stresses the ambiguous role of religion in humanitarian action. The author applies a human rights-based approach to humanitarian action and suggests the importance of recognition the ways religious ethics and related practices can both impede and support the advancement of human rights.

The intergovernmental theory demonstrates integration and a method of decision-making in international organizations. It allows states to cooperate in specific fields while retaining their sovereignty. In contrast to supranational bodies in which authority formally delegated, in intergovernmental organizations states do not share the power with other actors and take decisions by unanimity. Intergovernmental relations defined as formal and informal mechanisms to ensure coordination and cooperation between various levels of government in decentralized and federal political systems. Coordination between diverse levels required, because very often competencies overlap, and different policy issues require cooperation.

The implementation of the provisions of the values 'concept reflected in the pragmatic analysis of European Union values (Euro-Performing of Ukraine: Values do matter, 2017). European ideals are not just ethical guidelines for the behavior of citizens. These are, in fact, pragmatic principles, the primary practical meaning of which is the ability to uphold and strengthen democratic institutions, thereby creating an attractive "landscape" for joining the "European being." The pragmatic content of European Union values means the capability to support and build up the creation and function of effective democratic institutions.

The concepts of humanitarian safety and values linked and reflected a shared commitment on the part of the EU and member states to defend democratic, human rights-based, and solidarity principles while protecting vulnerable people. These values directed European humanitarian efforts and influenced how to protect people, created a system of humanitarian safety, and stimulated international humanitarian law application.

The overview of the basic concepts of humanitarian safety, functions, and mechanism introduces the necessity of the application of contemporary methodology based on interdisciplinary analysis application. This approach integrates the various disciplines of analysis and the variety of viewpoints about humanitarian safety that provide a synthesis on a given subject, theme, or issue of political, economic, legal, and social sciences estimation. A multidisciplinary approach examines the same subject from the perspectives of various academic fields and develops a methodology for humanitarian safety aligning common tendencies in various disciplines and expressing a universal value of humankind. It brought into question what basic instruments and methods from various disciplines could be applied in a multidisciplinary approach. The legal approach highlights the function of international law in resolving humanitarian issues in areas affected by severe conflicts. Giving people particular information about how others who behave similarly to them act can be sufficient to arrest the

erosion of norm compliance, according to the behavior concept. The institutional methodology places a strong emphasis on encouraging people to appreciate the organic character of society and people. The idea of culture examined by humanitarian experts who are better able to comprehend the actions or behaviors of people thanks to the development of the ethnocultural component of the activity. The pragmatic study of European Union ideals and values represented the application of the concept's humanitarian safety provision system.

The synthesis of the following methods allows us to examine the subject in a specific area, identify threats, and define the causes and factors for their reduction or elimination. The interdisciplinary methodology aimed to generalize and specify the common features and specific elements of political, legal, and economic narratives, to propose a broad analysis of existing problems, the conflict resolution mechanism, and policy measures.

Humanitarian safety provision system and European Union Values

The purpose of the paper is to examine the role of the European Union values in the process of enhancing the humanitarian safety provision system in Ukraine. The European Union approach considers a humanitarian safety provision system that refers to the procedures, guidelines, and measures put in place to safeguard and help those in need, notably those impacted by crises, armed conflicts, or natural disasters. The main principles of humanitarian assistance include humanity, neutrality, impartiality, and independence.

Resolutions of the UN Security Council have included references to humanitarian issues. These resolutions have addressed humanitarian action (providing emergency help during wartime and for other humanitarian services) as well as humanitarian law (calling for its compliance in ongoing hostilities, condemning violations, and authorizing action meant for various violations). To deal with humanitarian emergencies, the European Union has put in place of various procedures. A good example of this is the European Civil Protection and Humanitarian Aid Operations (ECHO), which offers funding, coordination, and emergency support during disasters and conflicts. Additionally, the EU backs international humanitarian organizations, spreads humanitarian values around the world, and promotes adherence to international humanitarian law.

The foundations and principles of national security and defense, the goals, and the basic principles of state policy, and guarantees for society and every citizen protection from threats are determined in the Law of Ukraine "On Fundamentals of National Security of Ukraine". The Law emphasized the key tenets of maintaining national security. They include: "the priorities of human rights and freedoms; the rule of law; the priority of peaceful negotiations in conflict resolution; the timely detection and necessary action to prevent and or neutralize implicit and explicit threats to the national interests of Ukraine; the clear divisions of responsibility and coordination between all national security state bodies; the democratic and civil control of all State Organizations, Military, and Armed Forces responsible for the National Security of

Ukraine; the use of international security systems and collective international security doctrine in the interests of Ukraine” (The Security Sector Legislation of Ukraine, 2013). The humanitarian safety system is the subsystem in the system of national security. It consists of the set of fundamental institutions, principles, and methods that guarantee the defense of a person's vital interests. To prevent threats and provide responses against aggression there is a need for constructing an effective system; including democratic institutions, and political and economic sovereignty, that keep a resilient socio-humanitarian system.

To ensure the state of humanitarian security, Bauk (2018) considers the restricted ability of authorized state agencies to implement the legal system through educational, organizational, informational, control, financial, and other methods. The functions of the humanitarian safety provision system include assisting the creation of conditions that promote all-around personal growth and the achievement of human development goals, as well as encouraging political, economic, social, and spiritual improvement (Horbatiuck, 2018).

Considering the diversity of scientific research, by the state security policy in the humanitarian sphere researchers, explore humanitarian safety provision mechanisms in providing actions of legal, economic, political, and financial institutions. Through prompt detection, prevention, and neutralization of threats in the humanitarian realm of the national security system, these activities aimed to ensure the protection of the vital interests of individuals, the strategic interests of society, and the state.

The social humanitarian model considers how values and ways of acting have changed, assuring the social system's sustainability and resilience in democratization process of legal, political, economic, social institutions formation (See Figure 1).

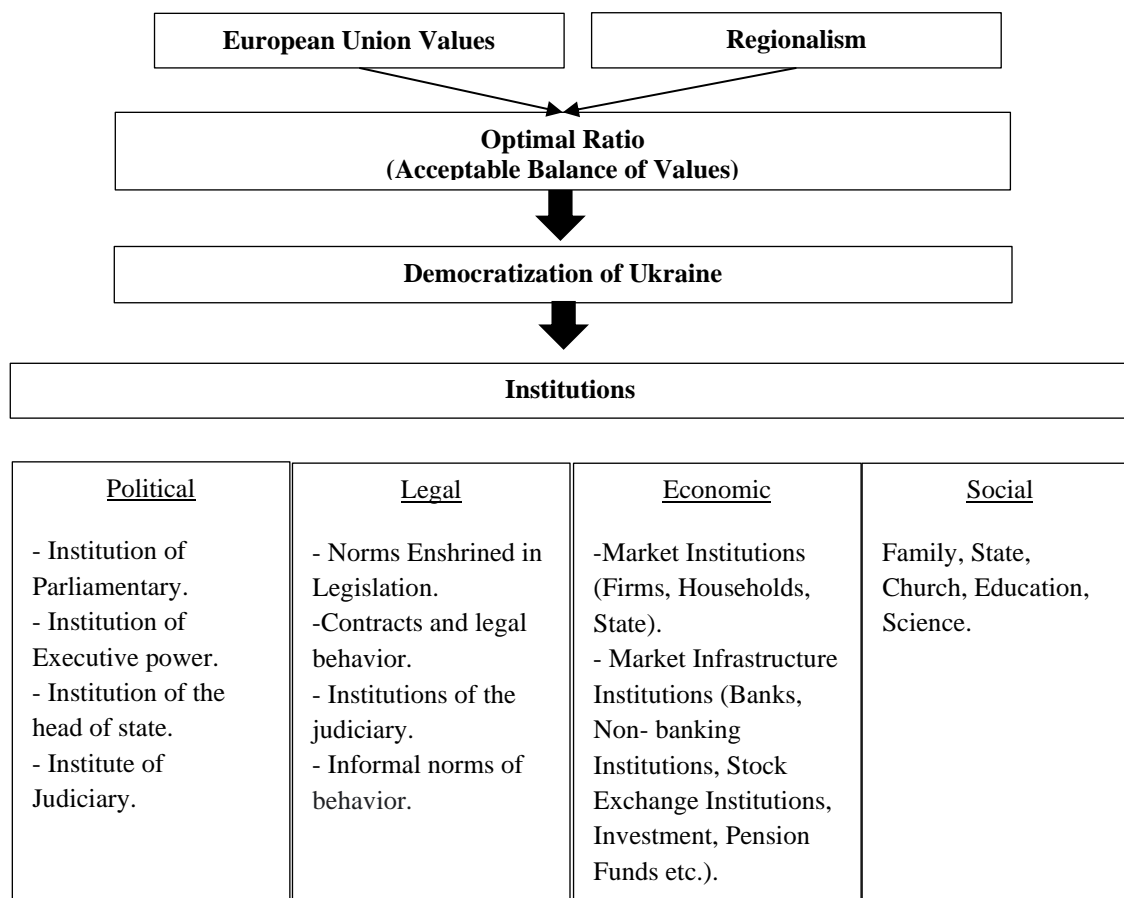


Figure 1. Democratization and European Union Values

The main objective of transformation is to transfer from a paternalistic model of state administration to the democratic, social–humanitarian model of priority of personal values and stable development of social, political, economic, and other institutions.

Human capital formation, social justice, legality, quality of life, and the realization of rights and freedoms can use to measure the humanitarian safety system's resilience. The objectives of state administration policy ensuring socio-humanitarian security at the central level are the protection and implementation of national interests in the socio-humanitarian sphere, facilitating the creation of conditions that promote all-round personal growth and the achievement of human development goals, and the encouragement of political, economic, social, and spiritual advancement. The establishment of state-wide structures to support socio-humanitarian development could achieve the promotion of international collaboration in the execution of European standards. The basic function of social humanitarian safety is the detection, prevention, and neutralization of existing threats. The evaluation of the degree of centralization or decentralization of the state's administration defines socio-humanitarian security. The monitoring of the state's management's effectiveness in the specified region is focused on

anticipating changes, threats, and destabilizing elements. The vital role belongs to political decision-makers who are responsible for social-humanitarian development. “Deciding on political measures based on a thorough comprehension of national objectives in areas like socio-humanitarian advancement and Ukraine's potential for European integration,” mentioned by Horbachuk (2018). If the share of regional values prevails over the European norms and rules it can demonstrate the danger of the emergence of destructive forces in society, and separatist tendencies, and contributes to the emergence of military conflicts. Then an argument can be advanced to encourage the government to adopt the practices for providing measures of a transparent system for balancing the interests of regions and the state.

The absence of complete accountability in many humanitarian operations is a special problem. Making sure there are complete and honest assessments of the goals and outcomes of humanitarian action is just as important as making sure the financial accounts are correct and properly audited. The essential element of humanitarian intervention during conflicts is crucial before it occurs through preparation and prevention, and it is crucial afterward to increase resilience and advance development. It should be mentioned that under the effect of media manipulation from both opposing sides, consciousness is changing. Conflict management, transformation, negotiation, communication, and shifting the emphasis away from destruction toward the creation of a peaceful society are all necessary components of the complicated, multi-level process that goes into ending destructive, violent conflicts. deteriorated drastically and rapidly on 24 February 2022, after Russia’s invasion dramatically escalated eight years of conflict into a full-scale war. Russia’s invasion of Ukraine has caused widespread death, destruction, displacement, and suffering of people. About 17.6 million people left their homes and are in urgent need of humanitarian assistance and protection. This group of people includes 5.1 million internally displaced people (IDPs), 5.9 million Ukrainian refugees across Europe, and 4.8 million returnees. The highest severity of needs is among people living in areas not under the Government of Ukraine’s control and in areas directly affected by active hostilities. Humanitarian organizations rapidly expanded operations and reached nearly 16 million people with critical assistance in 2022, despite immense challenges. The goal of the Ukraine Crisis Response (UCR) deliver comprehensive, need-based humanitarian aid to refugees, internally displaced people (IDPs), and the most vulnerable children and their families in Georgia, Ukraine, Romania, and Moldova. In addition to operating in 24 districts in Ukraine, 15 in Romania, 34 in Moldova, and 4 in Georgia, World Vision UCR collaborates with 53 partners and contributors. 4.4% of all those contacted to date—58,673 people reached in June 2023. In the reporting period has reached people in Ukraine 43,404 (74% of the overall people reached in June 2023), in Romania – 7,505 (13%), in Moldova – 6,308 (11%), in Georgia – 1,456 (2%). In total, the number of reached people versus targeted people accounted for 141% (OCHA, 2023).

The application of a typical method that Metcalfe et al. (2011), who manages making sure risk analysis incorporated into routine needs assessments, could estimate the existing conditions,

and needs in Ukraine. The relationship between humanitarian safety and European values reflects a global responsibility to humanitarian challenges in the world political crisis. While responding to crises and helping vulnerable people, European nations, and the EU work to promote European values of human dignity, solidarity, impartiality, and cooperation, demonstrating a sense of responsibility for the world and compassion for those in need.

Values survey estimations demonstrate of the existence a remarkable and persistent difference between Eastern and Western European values: high in the West and low in the East interpersonal trust (Halman et al., 2022). The ideological debates on the political models confirm the predominance of the paternalistic model of governance in East European countries. Alyushin (1992) defined the paternalistic model as a system of mutual claims and expectations, where one party expects to have its wants met immediately and the other expects diligence and conformity with the rules. The national identity formation was in the Soviet period. Still, it impeded because of the absence of an alternative ideology, a lack of critical assessment of the Soviet past, an absence of the vision of the outcome, an embryonic culture of democracy, and a preservation of the Soviet meaning of power. This is an explanation of the Ukrainian's values perceptions as tolerant, patient people, who value personal and family well-being historically live their own life, and do not trust a government, but subsume to its power (Nosova, 2022).

The democracy index estimation shows the speed of democratic process development and institutions. The comparison data the Table 1 illustrates three groups of countries with flawed democracy, hybrid regimes, and authoritarian (See Table 1). The first group of countries with flawed democracy characterizes by a transparent system of elections, a free and fair electoral process, and pluralism. Nevertheless, some countries, for example, Moldova had problems with the elections and infringements on media freedom. The weakness of democracy estimated from insufficient forms and methods of functioning of government, low levels of political engagement, and an underdeveloped political culture.

Table 1. Democracy Index 2022

	Overall score	Rank	Change in rank from previous year	I Electoral process and pluralism	II Functioning of government	III Political participation	IV Political culture	V Civil liberties
Flawed democracy								
Estonia	7.96	27	0	9.58	7.86	6.67	6.88	8.82
Latvia	7.37	38	0	9.58	6.07	6.11	6.25	8.82
Lithuania	7.31	39	1	9.58	6.43	6.11	5.63	8.82
Moldova	6.23	69	0	7.42	5.36	7.22	4.38	6.76
Hybrid regime								
Armenia	5.63	82	7	7.92	5.71	6.11	3.13	5.29
Ukraine	5.42	87	-1	6.50	2.71	7.22	6.25	4.41
Georgia	5.20	90	1	7.00	3.57	6.11	3.75	5.59
Turkey	4.35	103	0	3.50	5.00	5.56	5.63	2.06
Authoritarian regime								
Kyrgyz Republic	3.62	116	-1	4.33	1.50	4.44	3.13	4.71
Kazakhstan	3.08	127	1	0.50	3.21	5.00	3.75	2.94
Russia	2.28	146	-22	0.92	2.14	2.22	3.75	2.35
Belarus	1.99	153	-7	0.00	0.79	3.33	4.38	1.47

Source: Constructed on the data of Democracy Index 2022. Frontline Democracy and the Battle for Ukraine. (2023).

The second group of countries with a hybrid regime is related to having a free and fair electoral process and pluralism. The functioning of government distinguished via government pressure on opposition parties and opponent candidates. The insufficient political culture, weak functioning of government, and inadequate political participation impede democratic development. Undeveloped civil society, the absence of a free press and media, and pressure on the judiciary system prevent the formation of principles and norms of civil society. The social scenarios described in the media do not encourage people to participate in economic empowerment or to develop an awareness of societal economic dynamics. The democracy index of Ukraine decreased from 6.94 in 2006 to 5.42 in 2022 (Democracy Index 2022, 2023). In the period between 2000 and 2010, Ukraine moved out of the group of countries of “flawed democracy” countries toward to hybrid regime. After the Maidan protests and the pro-Russian period of President Viktor Yanukovich (2010-2014) worsened the economic position and caused the rollback of Ukraine to countries of the hybrid regime. The considerable flaws that hampered the Ukrainian elections prevented them from being free and fair. There were significant constitutional defects, with the presidency holding a disproportionate amount of authority compared to the legislature. The judicial system was not at all autonomous. A system dominated

by oligarchs, who had enormous influence over the key institutions of authority, plagued with corruption. There was a pluralistic media, although major channels owned by or under the control of powerful individuals. There was extremely little public faith in the executive branch, political parties, and the electoral process. The full-scale war in Ukraine has united the people as a nation and contributed to the growth of self-awareness.

The third group of countries with authoritarian regimes highlights the absence of free and democratic elections, the presence of dictatorship, the existence of formal functioning democratic institutions, civil liberties violations and abuses, control of media, and the absence of a judicial system. The data of Russia depicts the aggravation of the position country on 22 points in the assessment democratic index in 2022 compared to 2021. The country worsened the state of the electoral process and pluralism; civil liberties; the functioning of government; political participation; and political culture. The phenomenon of social dependency is explained by the hegemony of the neo-paternalistic model of relations, which is characterized by the existence of a sizable population that refuses to understand the reality of modern society and continues to expect the government to handle all their social issues (Kozyreva, 2020). The mechanism of social stereotypes' regulating influence on economic behavior involves selecting the pattern of behavior that is most convenient for the individual, as determined by his or her prior application experience while considering the cultural context, or the patterns of behavior that are typical in this society. Fukuyama (2014) put out the notion that for the peaceful coexistence of civilizations, some sort of shared value system is simply necessary in the circumstances of the modern world, where communities of people exist in isolation from one another. Rubinski (2013) points out the importance of European values as one of the main components of the spiritual heritage of all mankind.

Political values of liberalism, patriotism, protection of national and ethnic identity, and horizontal social hierarchy, humanitarian dominance have identified in Ukraine in World Values Survey 2020. Efficiency, speed, reliability, ease of use, flexibility, status, aesthetic appeal, emotion, and cost have defined as economic values. Assessment of respondents' freedom received 63.7% in comparison to equality (36.3%). Estimations freedom (34.1%) in comparison to security demonstrated that 65.9% respondents have chosen security. The observed changes in this study identified increased civic engagement, improved quality of life, and decreased paternalism. The received results can interpret as genuinely positive shifts toward values that, by the World Values Survey methodology, exist in prosperous and developed countries.

25% of Ukrainians, according to the Gorshenin Institute Assessment survey (2022), considered that Ukraine should pursue its course for growth. Integration into the EU supported by 51.6% of the respondents. To the question "What level of reproachment with the EU do you consider appropriate?" "26.5 % of Ukrainians chose the answer of the Common Labor Market, and only 26.4 % marked the "Common Economic System." Peace for Ukrainians marked as a basic value, just as the value of human life which the respondents put in second place. At the same

time, survey respondents believed that democracy was more important for Europeans than peace and human life.

Gradus Research Company survey (2022) confirmed the previous surveys' results. Most Ukrainian respondents invariably agreed that human life, freedoms and rights, social harmony, mutual assistance, and mutual trust were the greatest values – the greatest degree of consensus exists precisely about the value of life.

The value of implementing superiors' orders remained the most controversial in perception: the percentage of those who disagreed with the statement about its importance has increased (although such people are in the relative minority, as in the previous wave). Older people (55+) believed in the importance of life, human freedoms and rights, mutual assistance, and trust, as well as social harmony the most; at the same time, among them, there was a significant decrease in the share of those who value the implementation of superiors' orders. The safety assessment after a full-scale invasion of Ukraine in 2022 demonstrated a decreased share of respondents who rated life as unreasonable (48.2%) and wrong (50%) to 17.1% and 19.5%, respectively. The vector of morality strengthened on the positive pole due to the sense of justice in the fight against the aggressor. The assessment of life as worthy increased from 18.2% to 44%, 57.3% against 21.6% considered life human. The struggle for the protection of life and freedom was reflected in the perception of life as free, this assessment was supported by 58% of respondents in May 2022 compared to 29.5% in January 2022. Positive changes also occurred in the emotional state of the population: the ratio of optimists and pessimists changed in a mirror manner.

The survey's results confirmed the tendency of Ukrainian respondents were remarkably resilient and optimistic towards their future, and they believed in the importance of life, human freedoms and rights, mutual assistance, and trust. The democratic development of the country is based on the predominance of the rule of law; human rights and the protection of individual freedoms, functioning system of economic and political institutions.

Conclusions

The democratization of society is one of the prerequisites for the creation and regular functioning market economy. The pragmatic content of European Union values means the capability to support and build up the creation and function of effective democratic institutions. The humanitarian safety provision system and European values are two connected categories that highlight the EU's and European nations' shared commitment to safeguarding core values like democracy, human rights, and solidarity while protecting and helping those in need. These values direct European responses to humanitarian crises and influence how they participate in world affairs and solve humanitarian problems.

The analyzed survey's results highlighted that the majority believed that European values shared by Ukrainians need institutional encouragement for the entrepreneurial activities of the

businesspeople. It should be noted the process of replacing \the existing value systems \with those found in Europe, focuses on the moral recovery of society, relieving the burden of corruption, and the growing importance of culture in Ukraine.

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Empowering Education with AI: Addressing Ethical Concerns

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Abstract

There has been a rapid advancement of technology in the realm of education, and artificial intelligence (AI) has become just one of the many tools utilized by members of educational institutions. However, with the swift integration of AI into the education system, many ethical challenges and dilemmas have surfaced; primarily driven by students' misuse of the transformative technology. The potential impact on students' critical thinking skills, autonomy, and ethical decision-making further highlights the urgency to address these issues. This article explores the detrimental effects resulting from the unethical use of AI, along with proposing significant policies and guidelines in order to maximize the beneficial utilization of AI within educational institutions. Additionally, a comprehensive analysis of relevant studies will be presented to sustain the argument stated and contribute to the development of an AI learning environment that enables the prospering of both students and faculty.

Key words: Technology, Education, Artificial intelligence (AI), Ethics, AI Misuse, ethical decision-making , Policies, Beneficial utilization, integration

Introduction and Background

AI is often perceived as a complex system, yet it can be effectively simplified to ensure thorough understanding for all. Artificial intelligence (AI) is generally known as intelligent computer systems that are capable of performing tasks usually requiring human intelligence. Its wide array of versatile applications includes various techniques such as machine learning, language processing, and computer vision (Diaz, 2023). AI has opened up a world of endless possibilities, transforming various fields and the way we live, work, and interact. Nonetheless, without a structured framework of policies and guidelines, its unregulated implementations can lead to unprecedented consequences (Borenstein & Howard, 2023).

AI has gone through significant advancements, becoming highly accessible to the general public. This accessibility has resulted in students receiving answers on tests through online websites, along with plagiarizing on assignments. The most well known resource associated with cheating is a resource called ChatGPT. ChatGPT, OpenAI's new free chatbot, uses machine learning to respond to prompts in fluent natural language and code (Duffy & Weil, 2023). With this attainability, students have been leveraging it to their advantage, resulting in the loss of critical thinking skills, an increase in laziness, a lack of motivation, among others. As AI continues to advance, students will have access to an expanding pool of resources, which may hamper their ability to develop essential skills fostered within educational institutions (Chen, 2023). In an effort to mitigate the negative impacts of AI-enabled cheating, educational institutes must enforce policies and guidelines to promote a culture of integrity in schools.

Despite widespread awareness among educators regarding the drastic escalation in students' unethical use of AI, limited action has been taken to address the issue. In fact, a study conducted by UNESCO has discovered that *among* 450 schools and universities, less than 10% have developed institutional policies or a framework of formal guidelines concerning the utilization of AI applications. The absence of such guiding principles poses a significant challenge for educators striving to adapt to the accelerated expansion of this transformative technology. Many educational institutions have independently taken action, which has caused inconsistencies between facilities despite the availability of a standardized solution for all (Johnson, 2023). Some have been successful in their implementation of AI in their systems by accepting and adapting to the new innovation. On the other hand, numerous institutions remain ignorant of the current issues plaguing the field of education, and as a result, have resorted to ineffective measures of outright banning the integration of this emerging technology (Yang & Evans, 2023).

Once AI is properly established within the education system, an abundance of benefits and opportunities will follow which will revolutionize the whole learning experience for both students and educators. With AI as a powerful educational tool, personalized learning can be enhanced to cater individual needs and encourage engagement. The establishment of AI in education will leverage and elevate outcomes of students within education settings, allowing them to be prepared for challenges in the future.

AI Integration in Other Industries (Health and Finance)

The impact of artificial intelligence extends beyond the education system and is employed in various fields, including healthcare and finance. The integration of AI in these industries has brought forth a multitude of ethical challenges. The employment of AI in healthcare has led to improved diagnostics, personalized treatments, and enhanced patient care (Moore, 2023). Be that as it may, it has also raised concerns regarding privacy, data security, and the potential for biased decision-making. In the financial sector, AI algorithms enable efficient fraud detection, risk assessment, and automated trading. As a result, questions have arisen regarding algorithmic transparency, and accountability. Consequently, policymakers have been compelled to establish standardized policies and guidelines to mitigate the risks of misuse and ensure responsible implementation while also utilizing the maximum potential of AI in these fields for their benefit.

The incorporation of AI into the healthcare system has optimized the field of medicine. Many ways that AI is seen being used in healthcare include medical imaging, disease diagnosis and prediction, precision medicine, health monitoring and remote care, drug discovery and development, virtual assistants and chatbots, etc. AI algorithms can analyze medical images, such as X-rays and MRI scans, to identify patterns and anomalies that a human provider might miss. This can lead to earlier and more accurate diagnoses, resulting in better patient outcomes (Moore, 2023). However, along with its advantages, it has proposed risks of privacy and security. Numerous cases have been reported on health data breaches. One of the many cases include Baptist Medical Center and Resolute Health Hospital. The hacking incident affected a stagnant amount of 1.6 million patients. An “unauthorized party” gained access to some systems containing personal information and took data between March 31 and April 24, according to a statement from the hospitals (Southwick, 2023). The information may have included personal data such as dates of birth, Social Security numbers, health insurance information, other medical data, and billing and claims information. In order to avoid these risks, health care providers take traditional steps to ensure the security and privacy of patient data. Policymakers have created a framework of guidelines and policies including the minimum standards for AI in healthcare (Hernandez- Boussard et al., 2020) to specify the process in evaluations of data collected by AI models in research (Luo et al., 2016). Additionally, John Hopkins has conducted a study that has proved with the help of AI, privacy breaches can be prevented and detected more efficiently. With these policies and guidelines being set, ethical dilemmas faced by the field of medicine, including privacy breaches, have been easily prevented.

On top of that, the current impact of AI on the advancement of accounting and finance is indisputable. There are a great number of use cases for AI in finance, including fraud detection, risk assessment, trading, and enabling 24/7 customer service. While performing these tasks to perfection, the transformative technology saves a considerable amount of both money and time (Sajid, 2023). However, just like in education, the integration of AI in finance has faced its own ethical dilemmas. Transparency emerges as a pressing concern surrounding AI in a plethora of fields, including finance. The technology often provides decisions or answers without sufficient explanation or reasoning, leaving users with a lack of comprehension behind their actions and the underlying rationale behind them (Burt, 2019). Fortunately, the FTC requires companies to be transparent with the customer, whether the company is collecting sensitive data or using algorithmic decision-making to come to a

conclusion (Smith, 2020). Include specific situations that have occurred when they don't do this. Furthermore, in ethical dilemmas concerning AI, the FTC maintains its consistency, establishing the "FTC Act" and enacting the placement of laws, such as the Fair Credit Reporting Act (FCRA) in 1970 and the Equal Credit Opportunity Act (ECOA) in 1974 (Smith, 2020).

Even though these industries faced different ethical dilemmas than the ones presented in education, they were able to acknowledge the problems within their fields and collaborate to resolve the issues. This is an attitude that educators need to adopt. If the educational industry wants to address the ongoing issue with AI, then policies and guidelines need to be implemented in order to operate in an ethical manner, observing these industries as the standard.

Unregulated Use of AI

Artificial intelligence is rapidly becoming an everyday tool, similar in function to that of Google (Chiabaut, 2022). The rise of AI in teens' schoolwork seems to be increasing exponentially every year. A study from Big Village with over 1000 teens has revealed that more than 44% of those teens admitted to planning to use AI to complete assignments in the future (Conte, 2023). Consequently, 60% of them seemed to believe that the use of AI was cheating. This data once again raises concerns regarding ethical dilemmas within an educational setting in which AI is normalized. Furthermore, the Reboot Foundation conducted a recent research survey that provided evidence of deteriorating critical thinking skills and retention, with 86% of students lacking these skills (Reboot Foundation, 2020). The constant use of artificial intelligence is negatively affecting students of every kind, yet no action is currently being taken to address this problem.

This brings us to our most blatant question: why are ministries of education and educators doing absolutely nothing to guide and assist students? As exhibited earlier, a study conducted by UNESCO has discovered that among 450 schools and universities, less than 10% have developed institutional policies or a framework of formal guidelines concerning the utilization of AI applications (Giannini, 2023). In fact, educators are the only ones who can truly regulate AI's new and complex role in the education system. To do so, these educators need to come together and coordinate a regulatory system for these new technologies that are rapidly being introduced into education. Ironically enough, educators seem to believe the best way to address this issue is for each of them to create a solution on their own, resulting in different regulatory systems for different school districts (Ta & West, 2023). As this form of action has proven to be ineffective time and time again, educators need to realize they are misguided and change their approach to this challenge (Giannini, 2023).

Schools universally, especially within the U.S., have taken one of three actions: banning AI, integrating it into curricula, or putting it under further review (Ta & West, 2023). Many schools, such as Peninsula School District and Alliance City School District, have been working to integrate this technology into their curriculum, allowing them to be prepared when ChatGPT was first introduced. These school districts have been able to leverage AI in classroom settings while also regulating any negative use of the technology. Other schools, like Mineral Wells Independent School District, are still experimenting with the implementation of AI (Ta & West, 2023). They are currently trying to establish the role AI

will play within their education system and how to integrate it efficiently (Castillo, 2023). On the other hand, the most prominent school districts that have banned transformative technology include New York City Public Schools and Los Angeles Unified. Unfortunately, banning this technology is simply a “band-aid solution” and will not remain effective in the long term, as many students will continue to find shortcuts and loopholes to access artificial intelligence as they see fit (Ta & West, 2023).

The principle of this issue is as follows: as long as the root of the issue remains, then any measures taken will remain ineffective and inefficient (Matzinger, 2023). When certain educators put AI under review or simply ban it, they are implicitly admitting they don’t understand the function of the technology. Nonetheless, they are also unaware that they don’t necessarily have to be experts regarding artificial intelligence to counter the consequences of its misuse. As long as somebody has a basic understanding of ethical laws, then they can build upon those according to the field or industry they are employed in (Reiss, 2021). In addition to these laws, there are 4 specific ethical principles that apply to the education system. With this guiding constitution, all educators alike will be able to propose significant and structured policies in relation to the implementation of AI in education.

Ethical Guidelines

While there are seven main ethical principles, around eleven of them are applicable to the field of education. Establishing certain guidelines using these ethical principles as a framework would allow educators to properly regulate the use of AI (Reiss, 2021). This will eventually lead to an environment where both teachers and students can thrive in an educational setting. However, implementing them is simply not enough. There has to be a continuous effort to spread awareness among people regarding these principles and what they truly mean. After very thorough research, only about 5 ethics guidelines were identified as directly relevant to children in education (Adams et al., n.d.). These ethics guidelines include the basic principles of ethical values and an additional 4 principles that need to be taken into consideration due to the industry they are being implemented in.

Most of the traditional ethical principles are values that are displayed and introduced throughout a person’s day-to-day life. The best examples of this would be beliefs related to transparency, justice & fairness, responsibility, and privacy. In addition to these common values, there are more principles that are a little less familiar, but share the same idea. From the 5 guidelines, the other basic principles would be non-maleficence, beneficence, and freedom & autonomy. Non-maleficence is the ethical belief ensuring safety, beneficence is supporting and enhancing a person’s well-being through beneficial means, and autonomy is having the liberty to make choices (Adams et al., n.d.). These are the basic concepts for a structured framework of guidelines and policies.

Nevertheless, an educator needs to slightly alter these ideas to fit the values of education while also taking into account the use of AI. Education is centered around the growth and development of children until they are of legal age, meaning these principles have to play a similar role. These values can be expressed and derived from the addition of principles such as pedagogical appropriateness, children’s rights, AI literacy, and teacher’s well-being. Children’s rights and teacher’s well-being are self-explanatory, but phrases like pedagogical appropriateness and AI literacy are a bit more complex. Pedagogical appropriateness means

ensuring that teachers retain their professional freedom and responsibility to choose and use AI with due regard for “what is good or right and what is life enhancing, just, and supportive” of children and youth in their local classroom and community contexts. AI literacy refers to the importance of children and youth learning about AI so that they may be critically informed, as well as the need to build teacher knowledge capacity and parental awareness (Adams et al., n.d.). By establishing and spreading awareness of these principles within an educational setting, educators can govern the misuse of AI technology while utilizing it to benefit the classroom environment.

After a dramatic increase in plagiarism cases at Weill Cornell Medicine in Qatar, the administrators devised a plan to regulate the amount of cases occurring. In Phase 1, they collected data from as many faculty members as they could, and they also asked for suggestions in the process. During this phase, the administrators and researchers implemented many interventions regarding plagiarism and its ethical value, including a plagiarism policy published in their handbooks and on their websites, online tutorials and plagiarism seminars, and lastly, plagiarism detection software along with student resources to help handle the stress that comes with the class workload. Years after integrating this system, the researchers collected their results. Phase 2 revealed shocking data in which 37.5% of faculty reported no cases of plagiarism, unlike the 12.1% in Phase 1. On top of that, concerns about

Benefits of AI Implementation

The incorporation of AI systems into the education field is poised to trigger a transformation, fundamentally changing various aspects of the learning journey. Many changes are set to come with the integration of AI, along with the appropriate regulations set in place. For instance, AI will play a role in personalizing students' learning experiences by analyzing their learning patterns, strengths, and weaknesses. This will enable a tailored approach to education for each student (Rafferty, 2023). Adaptive learning platforms leverage this data to offer customized content that adjusts its difficulty level and pace to match each student's abilities. Additionally, AI-powered educational tools will be utilized for assignment assessment, providing feedback to students while allowing teachers to dedicate time to personalized instruction. Furthermore, interactive AI tools will establish a more engaging learning environment, allowing students to understand complex concepts more in-depth through engagement (Rafferty, 2023). However, AI could expand its reach beyond the traditional classroom setting and extend support to students with special needs. AI will provide assistance to special needs students by helping educators create personalized interventions for these students. Nevertheless, with AI's continuous expansion, it has the potential to assist in recognizing skills and areas of knowledge that ought to be incorporated into programs, ensuring that students are adequately prepared for the ever-changing job landscape. Lastly, in today's age, online platforms powered by AI have the potential to provide students in disadvantaged areas with valuable educational resources. This has the power to democratize access to high-quality education for all.

Critics who oppose the incorporation of AI in educational settings argue that AI will supplant teachers. However, this assumption is unfounded. AI technology has not developed — and likely never will — to a point where it can be a perfect replacement for human teachers (Rafferty, 2023). Despite the vast amount of information that AI can analyze regarding a

student's achievements and personal preferences, nothing can replace the power of a human educator when it comes to observing and comprehending students' emotional responses and connecting with them on an emotional level. AI will act as a supplemental tool for teachers, such as stimulating students. AI language models can be used to simulate students and demonstrate common traits found within students, including confusion and follow-up questions, as stated by Percy Liang, an associate professor of computer science at Stanford University (Chen, 2023). Furthermore, Dora Demszky, an assistant professor of data science at Stanford University, highlights AI's capability to provide real-time feedback and suggestions to assist educators, such as answering questions asked in class (Zhang & Aslan, 2023). Demszky added that AI can produce post-lesson reports that summarize classroom activity. The summary would include student speaking time along with the identification of the questions that triggered the most engagement. Nonetheless, Sal Khan, founder of the online learning environment Khan Academy, suggested that AI could help teachers stay up-to-date with the latest advancements in their field. For instance, a biology teacher could receive updates on breakthroughs in cancer research and utilize AI to keep their curriculum up to date (Maheshwari, 2023).

The creation and integration of the calculator into the education system was thought to mark the end of manual mathematical computation. However, as seen in today's world, it has become a resource that students and educators use to assist with mathematical or scientific computations in order to produce accurate results. Similarly, the integration of AI into the education system will allow the upcoming generation of students to thrive within an educational environment.

Conclusion

It is of paramount importance to educate students on the impact of AI on their education and the significance of ethical values when using such transformative technology. While AI has the potential to greatly enhance education, it is crucial that we approach its implementation thoughtfully, taking into consideration the challenges and ethical implications involved. With the help of ministries of education and educators, a distinctive balance between progressive teaching principles and ethical considerations will play a crucial role in uncovering the full advantages that AI can offer in the field of education for students and faculty alike.

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Revolutionizing Education: A Study on Intelligent Tutoring Systems In U.S Education

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Abstract

Over the decades, AI has been drastically impacting health care, entertainment, finance, transportation, and many other industries, but specifically, how has it impacted education systems in the United States? With a better ability at examining data points, strengths, and weaknesses, in this study, we investigate how MATHia, an intelligent tutoring system, uses AI and how it has affected student performance in mathematics. AI-driven online tutoring offers a human-like learning environment that encourages collaboration with the students in order to learn from them and create individualized courses based on the students' emotions, progress, and learning preferences. MATHia was developed to resemble a human tutor and personalize learning based on each individual's area of weakness. Did these online tutors present a cost-effective and revolutionary solution to real-life tutors? Was MATHia effective in enhancing students' knowledge of the mathematical concepts they had to learn? What can be done in the future to further expand the benefits of these systems? This research answers all of these questions by taking three standpoints into consideration (educational, economic, and futuristic standpoints), each with its own unique data, problems, and solutions to these problems.

Keywords: Intelligent Tutoring Systems, ITS, MATHia, Artificial Intelligence, AI, education, future, Research, Study, Students, Personalized Feedback, Algorithm

1. Introduction

1.1. What is AI

Artificial Intelligence (AI) is human-like intelligence demonstrated by self-learning machines and computers which mimic human behavior. It is even used by many of the most important programs in today's world, including Amazon, Google, and Microsoft. AI consists of methods that aid in simulating human behavior in computers and other devices. Even though we humans are the ones who created AI, we can only really manage it up until a point because AI eventually learns how to develop on its own.

1.2. Online tutoring AI

With the widespread popularization of Artificial Intelligence, online tutoring has emerged. AI driven online tutoring offers a human-like learning environment that encourages collaboration with the students in order to learn from them and create individualized courses based on the students' emotions, progress, and learning preferences (Fancsali et al., 2021). Additionally, it provides real time feedback and direction to the user based on their learning style, speed, and areas for improvement. Finally, online tutoring systems are flexible as they are constantly developing and evolving to better serve the learner through the use of a variety of learning mediums.

2. AI in Education

MATHia is an intelligent tutoring system that uses a 1 on 1 adjustable learning system that resembles a human tutor. Students 6 through 12 receive personalized support to help them prepare for the end of course examination. The AI driven tutoring provides students with personalized help based on their areas of weakness and helps them stay on path to master the end of course examination. AI tutoring has the potential to significantly impact and advance education through various means. One key benefit is personalized learning. AI tutoring systems can analyze a student's performance data and adapt to their individual needs and learning styles. By doing so, these systems provide personalized recommendations and adaptive feedback, ensuring that students receive targeted support in areas where they need it most. This personalized approach enables students to progress at their own pace, focusing on areas that require more attention and accelerating their learning in subjects where they excel.

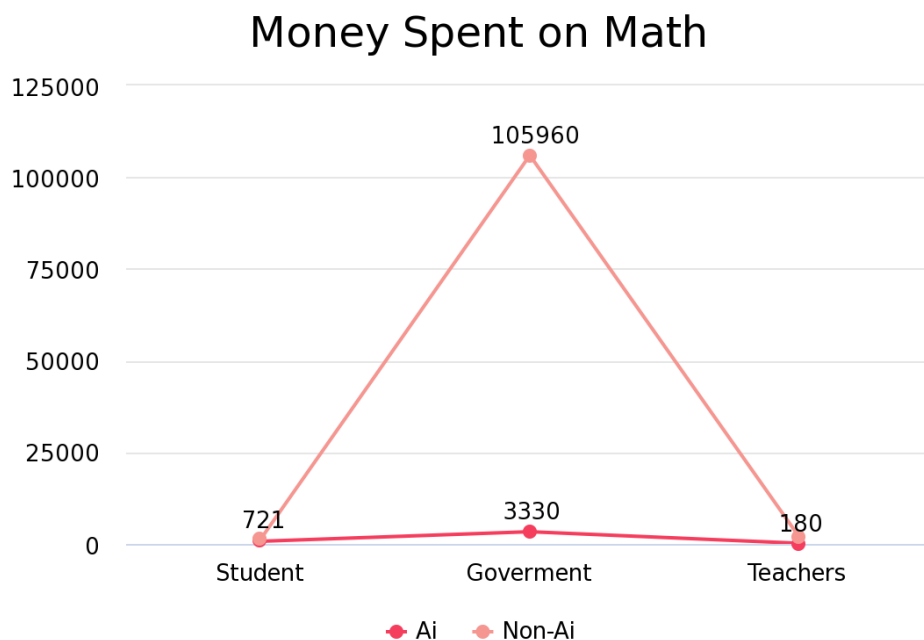
Additionally, AI tutoring can enhance the accessibility of education. With the help of AI-powered tools, students can access learning materials and tutoring assistance from anywhere at any time. This flexibility removes geographical and time constraints, enabling students in remote areas or those with busy schedules to receive quality education and support (Fordham University).

Furthermore, AI tutoring systems can handle large amounts of data and provide detailed insights into students' progress and areas of improvement. Educators can leverage these analytics to identify common learning gaps, optimize teaching strategies, and tailor their instruction to meet the specific needs of individual students or groups. This data-driven approach allows for more efficient and effective education delivery, resulting in improved learning outcomes (Jimenes, Boser, 2021).

3. Economic

To figure out the cost of switching everything in the state of Texas into MATHIA or any online learning would be a huge plus on the economic side. The biggest cost would be manufacturing the Aim but since we already have MATHIA fully developed we won't have to worry about that. The U.S. spends 870 billion dollars on education (National Center for Education Statistics, n.d.). With a data set taken from the school district in Texas. The math portion gets 12.18% that means we spend around 105.966 billion dollars on Math.

Now for the spending that the AI would need. First, all students have to acquire laptops. 87% of American teens have access to a desktop or laptop computer. That requires us to give the remaining 13% of students their own personal laptops (COE - Children's Internet Access at Home, n.d.). With students spending \$761.32 on average for a laptop. We get around 1.585 billion dollars on laptops for students who don't have any. We also have to look at the maintenance cost of the AI which can be all the way from 20,000 to 500,000 (Palokangas, 2023). The last cost would be the cost of internet which 95% of students already have access to internet (COE - Children's Internet Access at Home, n.d.-b) and the cost for internet subscriptions is around \$660 per person. Which would come up to be around \$528 million dollars. The annual subscription to MATHIA would cost around \$45 per student. Which would end up being around 720 million dollars a year. Altogether it would cost around \$3.333 billion dollars in cost yearly to keep up with the costs of switching to MATHIA. So we save around \$102.6327 billion dollars of course there are unexpected accidents like server breakdowns but they won't cost too much.



Graph. 1. Comparison of math expenses of the student, government, and teachers prior to and after the use of AI.

Now the uncertainties that are available. First, since we are giving laptops to kids they might break them, we could either supply one and the rest would be on the family if they broke but if we don't do that we can't be sure how many laptops would break as there is no data set that we could find. Second, we don't know how many extra servers we would need to sustain such a large project as we do not have access to MATHIA's financial spending on current servers or the exact amount of users they have.

4. Future of AI

4.1. Limitations of Online Tutoring AI

Due to long implementation delays, difficult integration, a lack of ethics, and exorbitant prices, AI has limitations. Long implementation timeframes, integration issues brought on by a lack of comprehension, and AI's lack of human ethics are all factors. Installation, repair, and upkeep all have high costs (Bisen et al., 2022).

4.2. Solution

Incorporating AI-powered Intelligent Tutoring Systems into our school's educational system is a good way to revolutionize the existing teaching and learning processes, but, as with most things, there are drawbacks. AI has a promising future in teaching because of its flexibility and accessibility. Furthermore, our study revealed that AI significantly reduces the cost of education. Not only does this help government funds spend less money, but it also benefits students because they can access tutors whenever they want and anywhere without having to be in a specific location with a real tutor. With the rise in AI learning applications, online learning will undoubtedly expand in the future. Therefore, we think that the employment of intelligent tutoring systems in education will be advantageous because of their individualized teaching strategies that will help each student perform at their highest level. We anticipate learning more in the future about the use of intelligent tutoring systems for a variety of subjects, including English, which requires one's own perspectives and critical thinking.

Conclusion

AI is the name for self learning intelligent program based machines that carry out duties assigned by humans. With AI's rising popularity, there are more Intelligent Tutoring Systems (ITS), often known as online tutoring systems, emerging. We specifically looked into MATHia its effects on student performance. The study conducted on Intelligent Tutoring Systems has deepened the understanding of their effects on the education system and economy. The results demonstrate that ITS have revolutionary impact. The accessibility, versatility, and financial advantages it offers give online tutoring a bright future.

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The impact of A.I on teaching and learning

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Abstract

The breakthroughs in AI have been ground-breaking in many fields such as military and industry, which have been deemed successful. It promises to be implemented and shows its importance in future opportunities. Following the development and advancement of artificial intelligence, there has been a need to incorporate artificial intelligence in teaching and learning. This paper shows a culmination of information from research to establish and emphasize the advantages that AI and Machine Learning will bring to the teaching process in years to come. The aim of this paper is to understand the benefits of this change in the teaching process, in the ease of understanding, and the ease in the acquisition of knowledge of the teachers' students. The findings from this research affirmed this.

Keywords: machine learning, classroom, education, learning, intelligence

1. Introduction

It is impossible to deny the impact rapid advancements in the development of Artificial Intelligence have left on every single field imaginable that is integrated with the use of technology, from the industrial field to the medical field and even the education sector. For example, in the education sector, IBM's Watson is used to enhance information gathering by students in real time. These advancements, even by referring to the aforementioned example, have transformed the educational sector and are continuing to transform it into a more beneficial, interactive and impactful learning and teaching process. The introduction of Artificial Intelligence into the classroom situation is a gradual yet fruitful process that will eventually nurture the student into being a better student overall in learning and the teacher as well in their teaching. This can be shown in the cases of teacher bots (Bayne 2015) or in Ozobots (Žáček and Pavel 2019) where they enhance the skills and abilities of the students as well as feeding them with necessary information in their respective studies.

In order to fully maximize the analysis of the literature review, we propose a definition of AI as outlined in the papers of the various respectable authors. Thus, we can define Artificial Intelligence as computing systems that are able to engage in human-like processes such as learning, adapting, synthesizing, self-correction and use of data for complex processing tasks (Popenici and Kerr 2017). By the definition in itself, we must therefore recognize the potential of the transformation of the education sector, specifically in teaching and learning by Artificial Intelligence. Some of the transformations have already been seen and likewise, their impact has been felt by the students, the main beneficiaries of teaching and learning.

Therefore, this paper serves as evidence, with information cited from many reputable journal articles, of the impacts of the developments in AI in teaching and learning.

Results and discussion

The study of AI and Machine Learning and its integration in the classroom have led to many developments. These technologies now augment the learning interactions of all students globally, enhancing possibilities opened for teaching and the design of educational experiences. (Popenici and Kerr 2017). Developments such as the Ozobot (Žáček and Pavel 2019) have had a positive impact on Education. An Ozobot is a miniature luminous robot of about 3cm in length and is designed to read the guidelines with sensors located at the bottom of the robot (Žáček and Pavel 2019). The robot can be controlled using blocks that the manufacturer named Ozoblocky and allows the student to program the Ozobot using individual commands and entire blocks of these commands. The programming element enables students who use this robot to develop their computational and analytical skills as well as the algorithmic thinking of the student. (Žáček and Pavel 2019)

Can AI ever replace the position of a teacher? Well, (Popenici and Kerr 2017) beg to differ. In the paper, Popenici and Kerr clearly outline that we should admit the current limits of technology and that AI is not(yet) ready to replace teachers but presents the potential to augment them. Although the positions of a teacher and a teaching assistant are not the same, we can still bring up the current achievements of AI as a teaching assistant. In (Popenici and Kerr 2017), Popenici and Kerr define a teacherbot as “any machine-based software or hardware that assumes the role traditionally performed by a teacher assistant in organizing information and providing fast answers to a wide set of predictable questions; it can be

facilitating, monitoring, assessing, and managing student learning within the online learning space.” An example of AI as a teaching assistant is seen in the situation at Georgia Tech where professor Ashok Goel used teacherbot, a virtual teaching assistant based on IBM’s Watson platform, as a teaching assistant while offering a course on knowledge-based artificial intelligence (KBAI) in the online Master in Computer Sciences program. The TA managed to meet the highest expectations of the students and was so valued by the students that one wanted to award the TA the teaching assistant of the month award. But to their surprise, they found out that Jill Watson, the name used by the teacherbot, was not a real person but only a teacherbot. (Maderer 2016)

Recently, there has been hype concerning ChatGPT. To understand it better, we asked ChatGPT, an open AI, what it is and it gave the following response, “ChatGPT is a language model developed by OpenAI. It's part of the GPT (Generative Pre-trained Transformer) family of models, which are designed to understand and generate human-like text based on the input they receive. GPT models are trained on large datasets containing text from the internet, books, articles, and more.” (By ChatGPT generated on August 26, 2023). We then followed up with another question and asked it how it works. It gave the following response, “ChatGPT generates human-like text responses given input prompts, useful for tasks like answering questions, holding conversations, and providing explanations. It uses patterns from its training data to produce coherent and contextually relevant text. (By ChatGPT generated on August 26, 2023). Through this interaction with ChatGPT, we see that it is interactional and capable of holding human-like conversations on a wide range of topics. With using this feature of ChatGPT, one can carry out teaching or self-learning by themselves. However, some educators have mixed feelings about the potential of ChatGPT in relation to education. David and Leticia show this in their paper by saying, “It has become a contentious topic among educators, while some perceive ChatGPT and related generative AI as the future of teaching and learning as well as educational research, others are sceptical and view it as a threat and a potential end to most educational activities and make teachers and students lazy with no or little analytical abilities.” (Baidoo-Anu and Ansah 2023). In their paper, they go on to show the benefits and drawbacks that ChatGPT can have in the field of education. They outline the benefits of personalized tutoring and learning (even in personalised learning platforms which are called adaptive learning systems) (Kabudi 2020), automated essay grading, language translation, interactive learning and adaptive learning. As aforementioned, they also go ahead and show the possible drawbacks of using ChatGPT in education: lack of human interaction, limited understanding (as generative models are based on statistical patterns in the data they are trained on), bias in training data, lack of creativity, dependency on data, lack of contextual understanding, limited ability to personalize instruction and the most important of all, privacy. (Baidoo-Anu and Ansah 2023). Other benefits specifically for teachers have been brought out in other research articles as well. Benefits such as improvement in teaching skills, the introduction of adaptive teaching strategies and the creation of automated and intelligent systems by teachers through AI-powered Chatbots that enable teachers to analyse and assess a student’s learning ability. (Adiguzel et al. 2023). However, due to the introduction of ChatGPT, many students have been dependent on the open AI tool in their work. This proves as a disadvantage to students in schools that forbid such technologies. To address this issue, guidelines have been proposed to help educators mitigate the risk of student dependency on AI such as ChatGPT for academic work. (Grassini 2023). This simply goes to show that even though the encroachment of AI in the education

sector is growing at an alarming rate, we need to be ready to impose guidelines and rules to curb such problems that we will surely face later on.

AI has also brought about the development of ITS (Intelligent Tutoring Systems) which can provide instruction by simulating a realistic working environment in which students can learn a task. ITS are defined as “computer-based learning systems which attempt to adapt to the needs of learners” with the “scientific goal to make computationally precise and explicit forms of educational, psychological and social knowledge which are often left implicit”. (Schiff 2021) By simulating this working environment, the risk of danger that poses itself to students and the costs that would come with the actual working environment can be mitigated. (Beck et al. 1996). Augmentation of ITS in teaching and learning can be important as these systems can allow a computerized system to present material in a “flexible, learner-centric way that addresses all of the idiosyncratic needs of the students while simultaneously being able to make sound pedagogical decisions on how best to ‘teach’ the student”, as explained in (Leahy et al. 2019). Likewise, ITS has the capability to interact with students at the step-level, rather than simply give feedback after completing the task. (Chassignol et al. 2018)

A persistent problem in the education sector was the inclusivity of all types of students, especially those with disabilities. (Vincent-Lancrin and Van der Vlies 2020) Recent developments actively show the effectiveness of AI in helping those with special needs to benefit from education. There are a number of mainstream AI tools that have been repurposed for learners with disabilities (Holmes and Tuomi 2022). An example of this is the app StorySign, an app made by Huawei that provides the sign translation of selected classics for children who have hearing impairments to also benefit from literacy education. (Huawei 2021). Another example is that visually impaired learners can wear wearables that use AI that can help the learner read a book or recognize faces and therefore can learn and socialize within their community. (Vincent-Lancrin and Van der Vlies 2020)

Conclusions

This paper presents the findings and shows the impacts and developments related to AI that are present in the education sector. It clearly outlines the advantages the integration of AI and the education sector has not only on the teaching process but in the acquisition of information by students methods such as personalized learning. By showing the advantages, it serves as an indicator for education systems to integrate these developments in order to reap the benefits shown in this paper. However, this paper also emphasizes the need to implement guidelines and policies to control the usage of these advanced technologies. Too much of anything is bad. We say this because letting students make use of the full potential of these technologies, can actually be counteractive as it would contribute to laziness in students and even lessen their creativity. Therefore as AI encroaches on the education sector, students need to be encouraged to not be too dependent on AI and rather use it to improve their learning process.

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Predicting student disengagement: Harnessing visual cues for intelligent tutoring systems

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Abstract

Intelligent tutoring systems have the potential to enhance the learning experience for children, but it is crucial to detect and address early signs of disengagement to ensure effective learning. In this paper, we propose a method that utilizes visual features from a tablet tutor's user-facing camera to predict whether a student will complete the current activity or disengage from it. Unlike previous approaches that relied on tutor-specific features, our method leverages visual cues, making it applicable to various tutoring systems. We employ a deep learning approach based on a Long Short Term Memory (LSTM) model with a target replication loss function for prediction. Our model is trained and tested on screen capture videos of children using a tablet tutor for learning basic Swahili literacy and numeracy in Tanzania. With 40% of the activity remaining, our model achieves a balanced-class size prediction accuracy of 73.3%. Furthermore, we analyze the variation in prediction accuracy across different tutor activities, revealing two distinct causes of disengagement. The findings indicate that our model can not only predict disengagement but also identify visual indicators of negative affective states that may not lead to non-completion of the task. This work contributes to the automated detection of early signs of disengagement, which can aid in improving tutoring systems and guiding pedagogical decisions in real time.

Keywords: Student Engagement, Visual Cues, Intelligent Tutoring Systems

1. Introduction

In the ever-evolving landscape of education, the concept of engagement stands as an irrefutably pivotal factor in shaping successful learning experiences. Across the trajectory of educational evolution, from the traditional chalk-and-blackboard classrooms of yesteryears to the digital frontiers of contemporary learning, one constant thread binds triumphant educational encounters – a student's active engagement with both the material and the process of learning. Far beyond the mere acquisition of knowledge, true learning involves a profound immersion, a cognitive and emotional connection that fosters holistic understanding and retention.

In the past two decades, the education sector has borne witness to an astonishing proliferation of technological interventions aimed at reshaping the very core of how we learn. However, these are no mere embellishments; they are monumental redefinitions of the very paradigms that underpin education. At the vanguard of this transformation stand intelligent tutoring systems – educational tools that promise personalized, adaptive, and responsive learning experiences tailored to the unique needs of each learner. Rooted in digital technology and driven by data, these systems are primed to outpace traditional methods by blending adaptability and scalability into a potent educational concoction.

Yet, the crux of these intelligent systems extends beyond the mere presentation of tailored content. Their true potency resides in their capability to perceive the learner – to discern moments of absorption, struggles, and the precipice of disengagement. Disengagement is not merely a transient distraction; it frequently signifies deeper challenges such as comprehension hurdles, emotional obstacles like monotony or frustration, or external distractions.

Traditionally, within a physical classroom, educators relied on their experience and intuition, interpreting cues like furrowed brows, wandering gazes, or restless movements to pivot their teaching approach. However, how does one transplant this intuitive responsiveness into the digital realm? And more intriguingly, how can technology not just replicate but amplify this responsiveness?

Herein lies the promise of tablet-based tutoring systems. Tablets, once devices of passive consumption, have metamorphosed into potent learning tools, driven by their portability and interactive potential. Their front-facing cameras, originally designed for video interactions, can metamorphose into the eyes of our intelligent tutoring systems, offering real-time insights into a student's level of engagement.

Nonetheless, the trajectory from capturing visual data to extracting meaningful insights is fraught with challenges. Varied lighting conditions, individual differences in expressions and gestures, and the subtleties of cultural context pose formidable obstacles. Furthermore, the pinnacle potential doesn't solely reside in detecting imminent disengagement; it lies in forecasting it before it crystallizes fully, enabling timely intervention.

This paper delves headlong into these intricate challenges. It introduces a pioneering method that harnesses the power of deep learning to decode and interpret visual cues collected in real-time from students using tablet-based tutors. With a focus on real-world data collected from Tanzania, the study embarks on a journey that transcends mere detection, aiming to comprehend and anticipate disengagement. By navigating these complexities, the intention is

to provide insights that could redefine the efficacy and impact of intelligent tutoring systems, rendering them more attuned, responsive, and ultimately effective.

2. Proposed Method

At the heart of our innovative approach lies a deliberate strategy to harness the wealth of visual cues, meticulously captured in real-time through the user-facing camera of a tablet-based tutor. As the educational landscape continues to meld with digital technology, tablets have emerged as versatile companions in the learning journey. From mere content consumption devices, they have metamorphosed into powerful tools that actively facilitate learning experiences. Their dual roles as content portals and interactive platforms offer a unique avenue to observe and comprehend the complex interplay between students and educational content.

When a student interacts with a tablet, an intricate narrative unfolds on their face – the furrows of their brows, the sparkle in their eyes, or the subtle shifts in their gaze. These facial expressions, coupled with gaze direction and micro-movements, represent a treasure trove of data encapsulating their emotional state and depth of engagement. Our method centers on precisely extracting and meticulously processing these invaluable visual cues, unraveling insights that possess the potential to redefine the contours of personalized learning experiences. In a departure from previous methodologies, which heavily relied on tutor-specific parameters or necessitated external hardware, our approach capitalizes on these visual cues, ensuring a versatile and universal solution apt for a broad spectrum of tutoring systems.

Deep learning, a revolutionary paradigm sweeping across various domains, stands as the cornerstone of our endeavor. Our deliberate selection of the Long Short-Term Memory (LSTM) model was far from arbitrary. As a subset of recurrent neural networks, LSTMs boast unparalleled proficiency in managing sequential data – a trait quintessential to the essence of video streams. The architecture of LSTMs facilitates the retention of vital information from prior sequences, dynamically influencing subsequent inputs. This aptitude for sequential processing empowers our model to weave a comprehensive tapestry of a student's engagement trajectory. Rather than offering a static snapshot of the learner's prevailing emotional and engagement state, the LSTM crafts an evolving portrait, tracing the ebb and flow of engagement and, more crucially, predicting potential shifts toward disengagement.

The bedrock of any prediction model hinges upon accuracy and reliability. In our pursuit to enhance the predictive prowess of our LSTM model and ensure its prognostications are as closely aligned with actual outcomes as possible, we introduced a target replication loss function. This pivotal function operates by minimizing the disparity between predicted outcomes and observed results in an ongoing manner. As the model iteratively predicts student engagement levels, it concurrently learns from any mismatches between predictions and real outcomes. This self-improving mechanism imparts the system with an adaptive learning capacity. The fruits of this constant refinement are manifest in the results: even with a substantial segment, roughly 40%, of activity yet to unfold, our model astoundingly achieves a balanced-class size prediction accuracy of 73.3%.

To conclude, our methodological design epitomizes the amalgamation of leading-edge technology and pedagogical insight. By synergizing the prowess of tablet-based visual feature extraction, advanced deep learning techniques, and an augmented prediction mechanism, we are on the cusp of introducing a transformative tool. This tool's significance transcends the mere detection of impending disengagement; it furnishes educators and intelligent systems with real-time, data-driven insights, enabling the proactive sculpting of educational strategies tailored to each student's needs.

3. Experimental Setup

Central to the empirical framework that underpins our research is an intricate and comprehensive data collection methodology. The foundation upon which our exploration rests is the collection of screen capture videos, offering an intimate window into the learning journeys of children as they embark on the path of acquiring basic Swahili literacy and numeracy skills. The significance of Swahili extends far beyond linguistic prowess; it embodies a cultural cornerstone in many East African nations and constitutes a critical skill set for young learners, particularly in regions like Tanzania.

These screen-capture videos transcend the mere documentation of a student's interaction with a digital learning interface; they encapsulate a nuanced glimpse into the multifaceted emotional and cognitive processes that unfold in real-time. Each pause, gesture, gaze shift, and facial expression paints a vivid picture, unveiling a rich tapestry of data points that offer a key to comprehending and predicting engagement trajectories.

The culmination of the data collection phase marks the entry point into the intricate dance of training and preparing our LSTM model. The meticulous orchestration of this phase involves feeding the model with an extensive array of visual cues and accompanying metadata, all gleaned from the screen capture videos. This symbiotic assimilation of visual and contextual information ensures that the model progressively internalizes the intricate patterns and interconnections that underscore the data – patterns that bind visual cues to varying degrees of engagement or disengagement.

As the arduous training regimen concludes, the model's transition into the testing phase unfolds. In this phase, a novel assortment of screen capture datasets, previously unseen by the model, is introduced. This crucial juncture acts as a litmus test, assessing the model's adaptability and its ability to generalize its predictions beyond the boundaries of the training dataset.

Critical to the evaluation of any predictive system is the establishment of a rigorous assessment framework. In our experimental setup, a pivotal yardstick was the quantification of our LSTM model's prediction accuracy. Given that our primary aim encompassed not just the detection but the anticipation of disengagement, an accuracy metric that considers potential class imbalances in real-world datasets was a natural choice.

This novel metric, the balanced-class size prediction accuracy, transcends conventional accuracy percentages by accounting for the intricate variations in class distribution. With a substantial portion, approximately 40%, of a learning activity left to unfold, our model's predictive outcomes were juxtaposed against actual outcomes. The results were revealing: a

commendable accuracy rate of 73.3% was achieved, underscoring the model's efficacy and its ability to foresee potential trajectories of engagement.

In conclusion, the architecture of our experimental setup rests upon the pillars of meticulous data collection, ardent model training and testing, and a meticulous evaluative framework. Every phase, seamlessly interwoven with technological precision and pedagogical acumen, was orchestrated to serve our overarching objective: the elevation of the digital learning experience through the prescient detection and strategic addressing of early signs of disengagement.

4. Results and Findings

Central to our investigative journey was the aspiration to accurately predict student disengagement, and the outcomes were nothing short of promising. Our meticulously trained LSTM model, after traversing rigorous training and testing phases, emerged as a noteworthy player, boasting an impressive accuracy rate of 73.3% when tasked with the intricate challenge of forecasting disengagement. This exceptional level of accuracy underscores the model's ability to discern subtle visual cues that could potentially herald a student's trajectory toward disengagement, even within the complex choreography of digital learning landscapes.

The 73.3% accuracy rate serves as a testament not solely to the potency of the deep learning architecture we harnessed but also to the richness of the screen capture dataset that underpins our research. With this level of predictive accuracy achieved, the realization of real-time interventions becomes palpably attainable, opening avenues for refining and enhancing the overarching learning experience.

While our focus was primarily centered on the overarching accuracy rate, a deeper analysis of our model's performance unveiled intriguing patterns. Variations in prediction accuracy emerged across diverse tutor activities, hinting at the dynamic nature of the learning process itself. Certain activities demonstrated a higher predictive accuracy, whereas others posed more intricate challenges to the model. This observation underscores the inherently multifaceted nature of the learning experience, where certain activities inherently evoke a broader spectrum of engagement behaviors, rendering them more challenging to predict uniformly.

This granularity in prediction accuracy variation accentuates the significance of grasping the idiosyncrasies of each tutor activity. Some activities, owing to their cognitive demands or novelty to the learner, tend to evoke a richer array of visual cues, necessitating the model to exercise a heightened level of discernment.

Among the most enlightening facets of our exploration was the discernment of distinct underpinnings for student disengagement. Our analysis illuminated two principal factors driving students away from active learning participation.

Firstly, visual cues indicative of negative affective states emerged as noteworthy triggers. While these indicators did not invariably culminate in task non-completion, they did manifest as precursors to potential disengagement. The early identification of these cues provides invaluable insights for educators and developers, equipping them to address root causes and recalibrate the trajectory of the learner.

Secondly, our scrutiny revealed the design and inherent nature of certain tutor activities as prospective disengagement catalysts. Some activities might fail to resonate with a learner's existing knowledge scaffold or learning style, inducing feelings of detachment or overwhelm. Detecting these activity-specific challenges presents a golden opportunity for course designers to iterate and optimize content, guaranteeing a more inclusive and engaging experience for learners across the spectrum.

To conclude, the results and findings of our research coalesce to depict a finely detailed portrait of the intricate dynamics of engagement within the digital learning realm. The achieved accuracy rate, coupled with nuanced insights into activity-specific prediction dynamics and root causes of disengagement, lays the foundation for the next phase of evolution in intelligent tutoring systems. Armed with these insights, the educational ecosystem is poised to transition towards a more personalized, responsive, and profoundly effective learning paradigm.

5. Implications and Applications

In an era where education has increasingly moved to a blend of digital and traditional mediums, understanding student engagement becomes more than just a theoretical imperative—it becomes a foundation for successful learning outcomes. The essence of our study dwells upon the transformational potential of automating the detection of student engagement. With our method, educators and intelligent tutoring systems can decipher the most intricate visual cues, identifying even the slightest drift in attention or the initial stages of frustration, often before they become overtly manifest.

What does such automation bring to the table? Firstly, it enables a shift from a reactive pedagogical approach to a proactive one. Traditionally, educators relied on feedback sessions, overt signs of restlessness, or the direct communication of issues by students. Now, with our model, the initial signs can be preemptively detected, ensuring timely intervention.

Furthermore, this automation has the potential to democratize the learning experience. It ensures that every student, regardless of how vocal or expressive they are about their struggles, is accounted for. The model's unbiased, consistent monitoring ensures that no student's difficulties go unnoticed. Additionally, by reducing the need for educators to be in constant vigilance for signs of disengagement, they can better channel their energies into enhancing the overall teaching and learning experience.

At its heart, our research is more than just a theoretical exploration; it offers a roadmap for tangible enhancements in the design and functionality of tutoring systems. By embedding our predictive model into these digital platforms, there's a unique opportunity to make them adaptive, dynamic, and highly responsive to individual student needs.

Consider this: as soon as the system identifies early signs of a student's confusion, it could instantly alter its instructional mode, introduce rejuvenating breaks, or offer additional explanatory resources. The model, in essence, could act as a continuous feedback loop, ensuring the content delivered is always in sync with the student's current state of understanding and engagement.

Moreover, as our model highlighted specific activities that showed heightened levels of disengagement, it offers a clear indicator to content developers about areas needing refinement. This proactive identification of potential trouble spots ensures that digital content can be fine-tuned to better align with diverse learning styles and preferences, ultimately driving toward a more universally effective teaching strategy.

Our research's real-world implications extend far beyond the realm of digital platforms. It holds the promise of revolutionizing classroom teaching as we know it. As our predictive model offers real-time alerts about emerging student disengagement, it can be a powerful tool for educators, enabling them to adapt their teaching strategies on-the-fly.

Imagine a large lecture hall, with dozens of students, each absorbed in their learning journey. The educator can't monitor every single student's engagement level. Here's where our model comes into play. With its continuous evaluation and feedback, educators can seamlessly adjust their teaching methodologies—be it through pacing alterations, the introduction of more interactive elements, or even by sparking impromptu discussions to rekindle interest.

This is not merely about preventing disengagement but elevating the entire learning experience. It's about ensuring that education remains a dynamic interplay of teaching and learning, where student feedback—both overt and covert—shapes pedagogical strategies in real-time.

In conclusion, our research offers more than just a sophisticated predictive model—it offers a vision for the future of education. A future where technological advancements and pedagogical insights converge, leading to a holistic, responsive, and deeply effective learning ecosystem.

6. Conclusion

The pursuit of academic excellence for young learners has long been a focal point of educational research and pedagogical advancements. At the core of this pursuit lies the implicit understanding that fostering a conducive learning environment can profoundly influence a child's cognitive and personal development. Our research, centered on optimizing the engagement levels of young learners, stands as a pioneering venture into the domain of intelligently adaptive educational platforms.

Our study demonstrates that children's learning experiences can be exponentially enriched when technological interfaces dynamically respond to their emotional and cognitive needs. By analyzing the intricate patterns of student interaction with tablet tutors, we've laid the foundational groundwork. This groundwork is more than just data and numbers; it encapsulates the vibrant spectrum of childhood curiosity, moments of epiphany, instances of struggle, and the triumphant joy of comprehension.

The realm of human-computer interaction, particularly in educational technology, has traditionally leaned heavily on metrics of usability, content clarity, and pedagogical consistency. Our innovative exploration into the significance of visual cues as predictors of student engagement has unearthed an additional dimension: the silent language of non-verbal communication in learning environments.

Children, especially during their formative years, convey a myriad of emotions and responses through their facial expressions, body language, and subtle gestures. These non-verbal cues, though often fleeting, are rich reservoirs of insight. They capture the child's unspoken dialogue with the content, reflecting moments of uncertainty, revelations, or potential disinterest. By harnessing and decoding these visual languages, we have unveiled a transformative tool for educators and technologists, opening up pathways for real-time pedagogical adaptability.

The horizons of our research, while expansive, still beckon with vast uncharted territories. One compelling direction for future exploration lies in the universality of our model's findings. Can the same set of visual cues reliably predict engagement levels across varying cultural, socio-economic, or age-based demographics?

As we progress into an era dominated by rapid technological advancements, the prospect of integrating more complex and nuanced monitoring tools becomes increasingly feasible. Consider the possibilities when combining our visual cue analysis with biometric feedback, like neural responses, heart rate variability, or even subtle changes in skin temperature. Such multi-modal approaches could weave an even richer tapestry of insights into a child's learning journey.

However, with these advancements come intricate ethical dilemmas. The continuous monitoring of students, while invaluable for pedagogical adaptability, also raises poignant questions about privacy, consent, and data security. Navigating this tightrope between innovative educational advancements and ethical considerations will be pivotal for future research endeavors.

To wrap up, our endeavors in this study represent a significant stride forward in the continuum of enhancing children's learning experiences. Yet, the path ahead is riddled with exciting challenges, untapped potential, and the promise of revolutionary pedagogical transformations. As we stand at this juncture, we're filled with optimism about the collaborative and interdisciplinary efforts that the future holds for the realm of education.

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Copy-Past Culture: Examining the Causes and Solutions to Source Code Plagiarism

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Abstract

In an era marked by the increasing digitization of society, the issue of source code plagiarism has emerged as a persistent concern. This research paper delves into the problem of source code plagiarism within educational settings, exploring its implications, potential remedies, and the associated hurdles in implementing these solutions. Source code plagiarism involves the unauthorized copying of code without proper attribution, and it has been on the rise in educational institutions due to various contributing factors. This paper sheds light on the educational system's pressures, time constraints, lofty expectations, and the allure of quick completion that make source code plagiarism appealing to students. Furthermore, it highlights the lack of understanding among students regarding academic integrity and citation methods, exacerbating the problem. Source code plagiarism not only hampers students' intellectual development and problem-solving skills but also undermines the fairness of assessments, posing grading challenges for educators. Nevertheless, there are several potential solutions. While proactive methods focus on prevention through education and policy, reactive methods employ AI-driven plagiarism detectors for detection. However, these solutions are not without their challenges, such as the issue of false positives in plagiarism detection and the potential adversarial response from students. In conclusion, source code plagiarism is a growing problem in modern society that can not be avoided any longer. Potential solutions to source code plagiarism should be taken into account while considering their withdrawals. Computer science and programming courses should foster a sense of integrity to avoid source code plagiarism and develop new generations of coders for the future.

Keywords: artificial intelligence, education, plagiarism.

1. Introduction

In today's digital age, where technology underpins nearly every facet of modern life, programming and coding skills have become increasingly valuable. As a result, educational institutions' computer science and programming courses have seen a surge in enrollment. With this surge, we have also seen a rise in a more pressing issue - source code plagiarism. Many have claimed the work of others as their own to ensure the sanctity of their grades or reputations. While the motives of plagiarism range from incompetence to indolence, the consequences for their lack of diligence remain all the same. Source code plagiarism is among the most prevalent forms of plagiarism in this digital age. Detecting source code plagiarism has become challenging due to the large amount of code teachers have to detect manually. Additionally, new loopholes to avoid AI detection are being continuously created.

Previous research touches upon the basis of source code plagiarism and its effects. However, most of the research obtained focuses on a sole aspect of source code plagiarism while also not considering source code plagiarism in education. Nevertheless, while the sources used in this paper focus on the implication plagiarism can have on our society as a whole, our paper emphasizes an individualistic perspective to help others understand potential circumstances that could hinder a student's learning.

This paper aims to explore the multifaceted issue of source code plagiarism in educational settings, investigating its implications, potential remedies, and the challenges that arise when attempting to address this problem. In doing so, we will shed light on the reasons behind the increasing prevalence of source code plagiarism, the impact on students, educators, and the integrity of educational institutions, and the strategies employed to combat this issue.

2. Understanding the Problem

Source code plagiarism is the act of copying code from another source without proper attribution or authorization. "Plagiarism [has become] ... a long-standing issue in academic institutions" due to the multiple ways students can go about plagiarizing others' source code (Cheers et al., 2021, p.50391). With the growing simplicity and security behind evading detection, "plagiarism can be a difficult and time-consuming task to identify, often requiring a large effort on the part of academics to review and assess assignment submissions for plagiarism" (Cheers et al., 2021, p.50391). This disarray has become increasingly concerning, as "overall employment in computer and information technology occupations is projected to grow 14.6% from 2021 to 2031" (Krutsch, 2022).

One method to plagiarize source code is the copy-and-paste method, where a student submits someone else's work unchanged without giving them proper credit. Regardless of how the information is presented, this form of blatant plagiarism clearly shows an individual's disregard for their education. Students often minimally alter the source code to differentiate it from its original work and prevent detection. In "extreme cases of plagiarism-hiding transformations," students would use "[p]ervasive plagiarism-hiding transformations" to alter the source code, "transforming it such that it bares little cosmetic or structural similarity" (Cheers et al., 2021, p.50392).

"In addition to verbatim copying of assignments between students, a programming assignment may also be considered plagiarized if code is reused between [a student's own] assignments (self plagiarizing)" (Buitendag et al., 2013, p.46). Unbeknownst to some students, reusing their old code to pass off as new work can be just as inappropriate as copying someone else's code because it deceives the reader of the true origin of the work.

Lastly, referencing someone else's code while incorrectly citing their work is also considered plagiarism. Although students do not attempt to take credit for original work that is not theirs, they misinform readers about whom the work belongs to, thus plagiarizing it. "This suggests that students' lack of understanding about plagiarism is not strongly correlated to a certain level of education...[as] many students think plagiarism can be avoided by citation and reference alone" (Buitendag et al., 2013, p.48).

3. The Root Causes

What exactly causes source code plagiarism in education? Source code plagiarism can be appealing to students in computer science and programming courses for several different reasons. Not only is there a plethora of accessible resources online, but it can also be seen as a quick and easy way to complete assignments for those who lack a general understanding of the topic, those who cannot correctly manage their time, and those who may crumble under high expectations from parents or teachers. "There are numerous examples of websites and services that host searchable code which is accessible by the public, e.g., question and answer sites that provide ready-made solutions to programming problems and websites where, for a relatively small fee, a programmer can be hired to complete a task. This provides enough resources to tempt a student to plagiarize part of or an entire assignment" (Buitendag et al., 2013, p.46). Source code plagiarism is often used as a coping mechanism for students who struggle with courses and fall behind.

Additionally, there are cases where source code plagiarism occurs unintentionally. "Plagiarism in student assignments continues to be a major concern in universities, mainly because of students' inadequate understanding of actions that constitute plagiarism and failure to comprehend and practice appropriate citation techniques" (Joy et al., 2013, p.4). A significant contributor to source code plagiarism is students' need for more understanding regarding academic integrity and citation methods. In some cases, students may be unaware of the consequences of copying code without proper attribution, viewing it as a permissible practice. Another major problem with source code plagiarism is the extent to which "acceptable collaboration" is allowed. "Confusion about the acceptable limits of collaboration is a particularly difficult problem in relation to source-code, since students are often encouraged to help each other learn by discussing their work" (Joy et al., 2013, p.15). The difference in collaboration between school and the workforce can create confusion for many students. "Collaborative system development in the software industry is common practice and reuse of source code within an organization would be encouraged to save both time and money. This approach is at odds with the individual approach necessary for assessment purposes" (Joy et al., 2013, p.16). The lack of education on what constitutes plagiarism and appropriate collaboration during assignments has led to the widespread source code plagiarism we see today.

4. Impact on Education and Individuals

How exactly does this affect our society? Source code plagiarism in education may not primarily affect the current generation of coders. However, it will have lasting effects on the future generation. The effects can be separated into two main categories: educational and mental. Educational effects stem from source code plagiarism's effects on the education system. "As the digital age is evolving, thereby increasing student access to information, it is becoming more difficult for academic institutions to maintain academic integrity across instructional programs" (Buitendag et al., 2013, p.46). Plagiarized assignments distort the evaluation process, making it challenging to gauge students' actual skills and comprehension of the subject matter. This, in turn, erodes the fairness of assessments and undermines the credibility of the educational institution's grading system. Students who fall to the temptation of source code plagiarism may be prone to carrying similar practices to other subjects, thus disheveling the education system.

The mental effects source code plagiarism has on students are also alarmingly detrimental. If this continues, many students incapable of writing their code may be brought into the workforce without the proper qualifications. Because they achieved their previous success in their school years, they may not be up to par when replicating that in the workforce. When students resort to copying code rather than working through programming challenges, they miss valuable opportunities to develop problem-solving skills and gain a deeper understanding of coding concepts. This hampers their growth as future programmers and engineers.

5. Proposed Solutions

How can we counteract source code plagiarism? The potential solutions to source code plagiarism can be separated into two categories: reactive and proactive methods. "Reactive" methods focus on catching plagiarism instead of preventing it (Buitendag et al., 2013, p.47). "Proactive" methods, on the other hand, focus on preventing plagiarism before it occurs (Buitendag et al., 2013, p.47).

Reactive methods use a combination of algorithms and techniques to create a detection engine suitable for the user. Multiple techniques have been used to find the best method to detect plagiarism successfully. "Some of them focus more on effectiveness factors (such as accuracy and the capability to detect complex modification) while the others focus on the efficiency (such as processing time)" (Karnalim et al., 2019, p.322). However, "[most automated source code plagiarism detection typically works in two consecutive phases: tokenization and comparison" (Karnalim et al., 2019, p.323). "Tokenization converts source code files to an intermediate representation prior to comparison" (Karnalim et al., 2019, p.323). As tokenization is the most common available representation, it has been adopted in numerous studies, some of which have been matured as tools, such as Jplag and YAP (Karnalim et al., 2019, p.323). "The comparison phase measures the similarity degree between two source code files based on their intermediate representation" (Karnalim et al., 2019, p.323). The comparison phase can then further be categorized into techniques: "namely structure-based, attribute-based, and hybrid" (Karnalim et al., 2019, p.323).

As previously stated, proactive methods focus on preventing source code plagiarism before it occurs. Academic institutions implement proactive methods by "educating students on plagiarism, creating clear anti-plagiarism policies across different academic programs, and adopting honor codes" (Buitendag et al., 2013, p.47). The implementation of honor codes fosters a sense of community among students, discouraging academic dishonesty due to the commitment to upholding trust. These codes complement anti-plagiarism policies, strengthening the deterrent against plagiarism by enhancing awareness of its potential consequences. Contrary to popular opinion, not every form of plagiarism is done with the malicious intent of taking someone's code. It is often seen that students cite the source of the code but do so incorrectly, thus committing plagiarism. Educational institutions can implement programs and workshops to educate students about academic integrity, plagiarism, and proper citation practices. By fostering a culture of integrity, institutions can reduce the allure of source code plagiarism to students.

6. Challenges in Implementing Solutions

Whether an academic institution decides to implement a proactive or reactive approach to plagiarism, there are downsides to each one. Proactive approaches focus on the long term and show little to no results in the short term. On the other hand, reactive methods focus on the short term but create issues in the long term.

Problems such as false positives, language barriers, and division between mentor and mentee often arise when implementing reactive methods. Regardless of the algorithm that one uses to detect source code plagiarism, there is always the possibility of false positives arising. False positives may arise for many reasons, but the most common is if there are standard design patterns in code. Since the most common plagiarism detection tools, such as Jplag, use tokenization to compare pairs of codes, it will flag instances in code that are commonly used. An example of this would be "if and else" statements. If the final project for a coding class asks for specific variables to be included or excluded, then it is likely that an "if and else" method will be created. Unfortunately, Jplag would flag all the codes as similar for having the same methods, even though it might be the easiest method to include and exclude variables.

Another issue would be the language barriers that some algorithms have. As there are over two hundred languages worldwide, having an algorithm be able to work in every single language is difficult. There are nuances in every language that should be taken into account when checking for plagiarism. This can be seen in the SuaCode Africa 2.0 experiment (Boateng & John, 2021, p.209). The algorithm for checking plagiarism in the SuaCode Africa 2.0 experiment solely applied to English and French (Boateng & John, 2021, p.209). Similarly, this problem arises in different programming languages. As SuaCode Africa 2.0 uses Processing-based code files, coding languages like Python can not be effectively detected for plagiarism (Boateng & John, 2021, p.211).

Although reactive methods provide instant results in discovering pieces of plagiarism, they have a negative impact in the long term. Researchers stress that as the reactive methods add little value to the academic process, it could lead to students focusing on ways to bypass the engine instead of learning the material (Buitendag et al., 2013, p.47). This could result from the students taking it as a personal attack, leading to students seeing their instructor "as the enemy instead of the mentor" (Buitendag et al., 2013, p.47).

Proactive methods, on the other hand, have different problems. As they focus on changing the student body as a whole, proactive methods require a significantly longer time to implement. As proactive methods fail to detect instances of plagiarism, students that do not care for honor codes or a sense of community are not deterred from it. The same problem arises when educational institutions fail to create clear anti-plagiarism policies that highlight the consequences that might arise if caught.

Conclusion

Source code plagiarism is a growing problem within educational settings, fueled by academic pressures, time constraints, and a lack of awareness about academic integrity. To combat this issue, educational institutions must adopt a multifaceted approach that combines education, clear guidelines, and the use of plagiarism detection tools. However, the implications of implementing these solutions must also be considered. Ultimately, computer science and programming courses must prioritize the cultivation of integrity to prevent source code plagiarism and nurture ethical coders for the future.

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Generative AI in Education

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Abstract

Recently, the field of artificial intelligence (AI) has advanced significantly, with generative AI rising to the top of the tech industry's most-discussed subjects list. Education like many other fields could be transformed by generative AI like ChatGPT, Bard, DALL-E, Midjourney, and DeepMind, which all have the ability to revolutionize a number of industries with all the benefits and drawbacks they entail.

The paper begins by providing an overview of generative AI, highlighting its capacity to generate human-like text, images, and even interactive simulations. It delves into the underlying principles and techniques that empower generative AI models, focusing on prominent models like ChatGPT and Midjourney.

To assess the effectiveness of generative AI in educational contexts, the paper examines studies that have evaluated learning outcomes, student engagement, and teacher support. These findings provide insights into the efficiency of generative AI as a supplementary educational tool and its role in fostering innovative teaching practices. Paper also addresses concerns around the technology being too integrated into education like over dependence and cheating.

Finally, the paper discusses future possibilities and challenges for the integration of generative AI in education. It proposes strategies for maximizing the benefits of this technology while ensuring ethical considerations are met. The paper concludes with a call for further research and collaboration between AI experts, educators, policymakers, and other stakeholders to harness the full potential of generative AI in transforming the learning landscape.

Keywords: generative AI, education, transformative technology, learning outcomes, student engagement, teacher support, ethical considerations, personalized learning experiences, biased content

1. Introduction

The way we interact with technology has been revolutionized in recent years with the fascinating advancements in the field of Artificial Intelligence (AI). Many industries reshape and reform to best accommodate these new technologies in what seems like a digital arms race. The most prominent results of these advances can be observed with Generative AI (GAI) models. Generative AI field aims for the creation of machines and algorithms capable of generating almost original and creative content such as images, text and even music. What separates them from conventional AI models is that instead of depending on pre-programmed rules they learn patterns and generate new outputs according to the data they trained on.

Due to their versatility their influence can be expected in almost any industry including education. Their potential to transform the learning experience can already be seen by the fact that in the past academic year, one third of the college students admittedly used ChatGPT, the most popular Generative AI example in the market and the fastest growing consumer application in history [4]. However, concerns arise with the topic of integration of Generative AI into the field of education. These concerns include issues of over-dependence on AI, potential ethical considerations, and the risk of technology-enabled cheating.

The purpose of this essay is to investigate how generative AI can revolutionize education. We will evaluate studies on learning results, student engagement, and teacher support in order to determine the viability of generative AI as a complementary teaching tool. We will also discuss issues with generative AI integration in education, such as over-dependence and cheating, and propose solutions to maximize benefits while upholding ethical standards. This paper's ultimate goal is to offer recommendations and insights for utilizing generative AI's full potential to revolutionize the learning environment and to promote cooperation between AI professionals, educators, policymakers, and other stakeholders in order to shape the future of education.

2. Overview of Generative AI

The term Generative AI refers to the branch of AI that mainly pursues the development of models that can create original and creative content. This requires the models to learn from data they are trained with and produce new outputs. Several models have helped to popularize the technology. ChatGPT, created by OpenAI, set the record for the fastest-growing consumer application when it gained a million subscribers in five days and 100 million users two months after it went public in November 2022 [5]. The ability of ChatGPT, a chatbot powered by Generative AI, to comprehend a wide range of human languages and produce rich, organized responses astounded the world. DALL-E, another instance of generative AI created by OpenAI, operates similarly to ChatGPT but produces digital images instead. Both applications were developed with the help of deep learning, a kind of machine learning that mimics how the human brain learns and responds to data, information, and cues [11]. Google quickly replied by announcing Bard, their own Generative AI

3. Evaluating the Effectiveness of Generative AI in Education

Currently, a large number of educational applications based on generative AI technology have arisen thanks to the popularity of mobile devices like smartphones and tablets as well as the growth of network technology. These programs can give students practical learning tools, aid

in knowledge acquisition, and facilitate understanding. In addition, certain applications can employ generative AI to offer students real-time intelligent assessment and feedback as they are learning, assisting them in more effectively identifying and correcting mistakes and enhancing learning efficiency. As an instance, let's look at the free language learning tool Duolingo, which uses generative AI. To assist in creating new features, the company created a generative AI model dubbed Birdbrain [7]. English, Spanish, French, German, Italian, Portuguese, Dutch, Russian, and Chinese are just a few of the languages that users can study. The main idea behind Duolingo is to make learning a new language fun and engaging for users by using interactive teaching techniques.[6] Users can hone their language skills by completing the application's different grammar, vocabulary, listening, speaking, and reading comprehension tasks. In addition, Duolingo offers real-time feedback and individualized study programs to help users better understand their learning progress and issues and offer pertinent guidance and support. With tens of millions of users worldwide, Duolingo is a well-known language learning program thanks to its straightforward, user-friendly, and cost-free open features. As a result, generative AI-based educational applications have developed into crucial support tools for the education of contemporary students, providing a wealth of benefits and prospects.

Another promising example is Squirrel Ai Learning which is a Chinese company that employs generative AI and an approach called "Adaptive Education" to customize learning for specific students. A tailored study plan is made for each student using the company's AI-powered system, which evaluates their learning habits and makes adjustments in real-time. The company claims that this strategy has significantly improved student performance. For instance, in a randomized control study carried out by the Chinese government, students using Squirrel AI Learning's system outperformed students in the control group by 17.22% on a standardized test [8]. Education in China's rural areas has benefited greatly from Squirrel Ai Learning. The company claims that more than 1,200 schools in rural areas have implemented its method, improving educational performance for students who might not have otherwise had access to a high-quality education. To customize learning for specific students, Squirrel AI Learning uses generative AI. A tailored learning plan is created using an analysis of each student's learning behavior by the company's AI-powered system, which adapts in real-time.

Due to the recency of the more mainstream examples of the technology, the number of documented implementations and research regarding its effectiveness is far from sufficient. While conferences [9] that include educators and policy makers take place, careful implementation of the technology is among the hot topics. As the integration progresses to a more widespread crowd more accurate points can be made regarding the effectiveness of GAI in education.

4. Concerns and Challenges

Although generative AI in education has many advantages, downsides may also need to be considered. The growing use of generative AI systems in education creates a complex environment that necessitates a thorough analysis of its far-reaching effects. As we go further into this process, a variety of issues emerge, each having the potential to fundamentally alter the course of education.

One critical issue to overcome is the complicated matter of authenticity and credibility. The line between work created by machines and that developed by human hands blurs as AI-generated material becomes increasingly common. This creates an obstacle for educators as well as students because it gets harder and harder to pinpoint the original source of a piece of content. The situation extends to assessments and assignments, where teachers may have trouble accurately assessing the caliber and originality of work produced by AI.

Although AI tools provide the possibility of efficiency and scalability, they also run the risk of lessening the importance of the human element in education. Meaningful interactions between teachers and students support the development of students' emotions and social skills in addition to the sharing of knowledge. The development of critical interpersonal skills may be negatively impacted by the unintended consequences of the introduction of AI, which could result in a decrease in these crucial human relationships.

Also as AI systems learn from existing data, they can inadvertently inherit biases present in their data. Given that the algorithms are only as unbiased as the data they are trained on, one worry is the possibility of bias in educational material that is generated. It is not implausible that a generative AI program designed for a specific student population based on their race, gender, or socioeconomic level could perpetuate unfavorable preconceptions and have a detrimental effect on their educational experience. Above all, we must ensure that generative AI systems are created and developed to be equal and inclusive for all users.

The use of AI in education requires a careful analysis of copyright, intellectual property, and ethical issues. Discussions regarding who owns the rights to AI-assisted creations can start when AI-generated content becomes prevalent since it can muddy the borders between authorship and ownership. It's essential to address these issues if you want to provide a fair and open educational setting.

A frequently overlooked topic is data privacy and security. A great deal of data, perhaps including private student or educator information, is needed for the functioning of a generative AI model. For the sake of safeguarding all parties' rights and establishing confidence, it is crucial to ensure that there are strong security measures in place to secure sensitive data from theft or misuse.

However, in the midst of all these debates, it is critical not to forget the digital divide that could be increased by the use of AI capabilities. The resources and technology required for effective engagement with AI-powered education are not equally available to all educational institutions or students. A discrepancy between rich students who gain from AI-enhanced learning and less fortunate students who fall further behind might ensue from failing to close this gap.

The conclusion is that although generative AI integration in education has enormous promise, it requires an in-depth approach that takes into account not only the technological issues but also the ethical, social, and practical implications as well. To create a comprehensive and inclusive educational environment, it is essential to strike the correct balance between the benefits of AI and the indispensable contributions of human educators.

5. Future Possibilities and Strategies

The field of education is on the verge of a transformation as technology continues to grow at a pace that is unprecedented. Systems like ChatGPT serve as excellent examples of the ways that generative AI integration may be used to transform how teachers and students interact with material, solve problems, and engage in learning experiences.

AI as a Complex Information Source and Learning Tool

Beyond simple online searches, generative AI plays a larger role in education as a source rich in depth and complexity. Contrary to traditional search engines, AI systems like ChatGPT can offer complex explanations, insights, and discussions on a variety of subjects. Teachers can encourage students to explore deeper into subjects by employing AI as a more complicated information source than conventional search engines, which will build critical thinking and analytical skills.

Access to Model Work and Remixing of Student Work

With the help of generative AI, students can access a variety of well-written essays, research papers, creative projects, and other types of assignments. By presenting exceptional work, this resource might encourage students to set higher standards for their studies. AI can also make it easier for students to remix their own work, which promotes innovation and teamwork as they rework and expand on each other's concepts.

Enhancing Classroom Activities and Teacher Tasks

AI should be integrated into education without replacing teachers; instead, it can support them by making some duties easier. AI systems can help with assignment grading, fast feedback, and even the creation of individualized lesson plans that are catered to the needs of each student. Additionally, AI can be easily integrated into well-known classroom techniques like the "think pair share" routine [10], enabling a variety of viewpoints and lively conversations.

Supporting Text Summarization and Addressing Difficult Problems

The ability of AI to convey materials accurately and clearly can help students comprehend difficult subjects effectively. Additionally, generative AI's strength shows when applied to complex, all-encompassing issues that call for original thinking. With the aid of AI, students may analyze complex problems and come up with fresh insights and creative solutions.

Artificial Intelligence as a Grading, Feedback, and Student Engagement Aid

Systems with generative AI can help teachers grade assignments and offer helpful criticism. In addition to saving time, this promotes assessment uniformity and objectivity. Additionally, including students in discussions with AI can help them develop their critical thinking abilities and improve their ability to present well-supported arguments.

Personalizing Learning and Facilitating Discussions

Since AI is so adaptable, educators can design individualized lessons that are tailored to each student's particular strengths and weaknesses. AI acts as a catalyst for meaningful classroom interactions by producing debate topics and prompts, which motivates students to deeply engage with the material.

AI-Enhanced In-Person Instruction

In a hybrid learning setting, AI can enhance in-person training by providing extra resources, responding to inquiries, and delivering assistance outside of scheduled class times. Students will always have access to materials and help thanks to this hybrid approach.

6. Conclusion and Call to Action

In conclusion, the use of generative AI in education opens up a range of prospects that have the potential to transform how we engage with information and how we learn. It is vital to embrace the revolutionary potential of generative AI while addressing the problems and ethical issues it brings as we stand at a crossroads of technological advancement and educational achievement.

Modern education's future can be seen in the incredible versatility of generative AI models like ChatGPT, DALL-E, and Midjourney. A dramatic change in how instructors can interact with students and promote learning has been made possible by the ability to generate text, graphics, simulations, and tailored learning experiences. The popularity of programs like Duolingo, Squirrel Ai Learning, Mathway and Grammarly demonstrates how AI has the ability to improve language learning, design personalized learning routes, teach complex topics or even help with writing which are all advantageous to a wide spectrum of learners.

This trip does not, however, come without difficulties. Authenticity and credibility have emerged as major issues as generative AI becomes more prominent in the educational setting. It's difficult for both instructors and students to distinguish between information produced by AI and human authors' work. Furthermore, the danger of over-relying on AI, the possibility of biased content, data protection, and the digital divide all highlight the necessity of a careful and well-balanced integration plan.

A collaborative effort is essential to maximizing the potential of generative AI in education. To create a future where AI enhances the distinctive qualities of human teachers, promotes critical thinking, and stimulates creativity, AI experts, educators, policymakers, and stakeholders must collaborate. Ethics should inform research and development to ensure that generative AI improves learning without undermining the principles of equity, inclusion, and personal development.

The call to action is loud and clear: educators and AI experts must collaborate to design and execute cutting-edge approaches that maximize the advantages of generative AI while minimizing its drawbacks. A balanced educational environment that smoothly integrates AI tools to empower students, improve methods of instruction, and prepare learners for the difficult challenges of the future requires ongoing research, pilot programs, and interdisciplinary conversations. By doing this, we may fulfill the potential of generative AI as an educationally transformational force and build a more inclusive and dynamic learning environment for future generations.

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Exploring the Impact of Excessive Social Media Use on Mental Health and Social Interaction

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Abstract

This paper examines the impact of excessive social media usage on mental health and well-being, focusing on its potential to trigger antisocial behavior, deteriorate mental health, and foster addictive tendencies. Despite the label "social," social media can diminish social interactions, contributing to feelings of loneliness and heightened social anxiety. Neurologically, the brain's reward system responds to social media interactions with dopamine release, cultivating addictive behavior, especially among young users. Studies reveal direct links between extensive social media engagement and increased anxiety and depression. The intricate relationship between dopamine, digital engagement, and mental well-being underscores the vulnerability of younger individuals. Balancing the allure of virtual connection with the risks of addiction necessitates a mindful approach to social media usage, including time limits and the pursuit of diverse offline activities. This inquiry highlights the importance of informed engagement to preserve well-being in the era of pervasive social media.

Keywords: Social Media, Mental Health, Addiction, Dopamine, Antisocial, Youth, Mindfulness, Loneliness, Well-being

Introduction

Social media has seamlessly integrated into the fabric of our daily lives, providing a platform for connection and communication. However, recent reports have raised concerns about the extent of our engagement with these digital platforms. The New York Times, for instance, highlights a worrisome trend among 13-18-year-olds, whose daily screen time has surged from an already staggering seven hours and twenty-two minutes to an astonishing eight hours and thirty-nine minutes in the past year. On the contrary, Medical News Today suggests a more modest and healthier threshold of around 30 minutes of daily social media use. The growing consensus among experts is that excessive screen time, particularly on social media, can exert a negative impact on mental health and overall well-being. In this context, this paper delves into the ramifications of spending excessive time on social media, delving into its potential to foster antisocial behavior, deteriorate mental health, and cultivate addictive tendencies.

Social Media and Antisocial Behavior

Despite the ostensibly "social" nature of these platforms, a paradox emerges: excessive indulgence in social media can make individuals less social. Emerging research underscores a correlation between heightened social media use and increased feelings of loneliness. The substitution of face-to-face interactions with virtual engagements erodes crucial social skills over time, potentially leading to heightened social anxiety. Experts at Helpguide.org shed light on the intricate hormonal dynamics at play, noting that in-person interactions are pivotal for the release of stress-alleviating hormones that contribute to feelings of happiness and well-being. Baylor Scott&White chimes in, revealing that those who allocate extensive time to social media are at least twice as likely to experience social isolation, and that these platforms gradually replace genuine interpersonal experiences.

Social Media and Addiction

A deeper exploration of the neurological underpinnings reveals a compelling aspect of human behavior. The brain's intricate reward system is hard-wired to seek out activities that trigger the release of dopamine, a neurotransmitter linked to pleasure and learning. Within the realm of social media, every notification, like, share, or comment stimulates an instant surge of dopamine, akin to a pleasurable reward. JeffersonHealth elaborates on this mechanism, illustrating how the recurrent dopamine-driven rushes propel users into patterns of addictive behavior. Alarming trends are observed among younger users, with Dr. Nancy Deangelis CRNP cautioning against the risk of rewiring young brains to incessantly seek instant gratification, potentially culminating in obsessive and compulsive behaviors.

Social Media and Mental Health

The correlation between social media and mental health, particularly anxiety and depression, has garnered considerable attention. Disturbingly, certain studies imply a direct association between excessive social media usage and heightened anxiety and depression. The brain's reward center, stimulated by social media interactions, releases dopamine, commonly referred

to as the "feel-good chemical." This system, while seemingly benign, poses a challenge: the brain adapts to these surges, leading to reduced pleasure during times when users abstain from social media. The resultant dopamine deficiency during off-screen periods can precipitate anxiety and depression. The relationship between digital dopamine and mental well-being is intricate and consequential.

Conclusion

The generation most vulnerable to these dynamics is the young cohort who frequently navigate the digital landscape without a complete understanding of its implications. The consequences of such uninhibited engagement are multifold: diminished social interactions, adverse effects on mental health, and the lurking shadow of addiction. The remedy lies in moderation: embracing limits on social media time, seeking alternative activities that enrich one's life, and cultivating mindfulness about digital usage. Balancing the benefits of connection and communication with the perils of overindulgence in the digital realm is a pivotal endeavor in safeguarding our well-being in the age of social media.

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Artificial Intelligence and Underfunded Education

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Abstract

There has been a lot of general research on education, but the unique topic of underfunded education has been largely untouched. Millions of students around the world get a low-quality education due to problems in underfunded education such as the lack of experienced teachers, a high student-teacher ratio and outdated curricula. This negatively impacts them and their respective countries in the future due to subpar performance both in school and in the workplace; further exacerbating the educational and economic disparities between countries. The lack of research in this area is due to the various unique challenges facing underfunded education and the difficulty in solving them with conventional methods. However, many tools that utilise Artificial Intelligence (AI) such as adaptive learning systems, chatbots, virtual assistants and Intelligent Assessment Systems can be used to solve or at least manage these problems, making the process of education more streamlined, efficient and effective. The purpose of this study is to explore the possibility of implementing AI into underfunded education and the numerous benefits that doing so would bring. We also outline the various challenges that would be faced in implementation and possible solutions to them.

Keywords: underfunded education, rural education, artificial intelligence education, AI education, personalised learning, intelligent tutoring system, large classes, student-teacher ratio, electric access

1. Introduction

Underfunded education has historically disadvantaged millions of students worldwide. It has caused them to fall far behind their peers who have access to a higher quality of education. This poses a setback to the students from the very beginning, creating further inequality in the students' education on top of the already existing economic disparities.

Education is an integral building block of the individual and society as a whole. Therefore, its improvement must be heavily prioritised and its problems immediately addressed. Artificial Intelligence (AI) has shown great potential in addressing many of the challenges facing underfunded education. With the sudden boom in popularity of AI chatbots such as ChatGPT, Google Bard and Claude AI, the untapped potential that lies in Artificial Intelligence has never been more apparent. The level of personalisation brought about by AI will be fundamental in revolutionising the process of education, improving the students' experience by engaging them on a more personal level, and taking some load off of the teacher as they may be dealing with very many students. While many schools around the world have shown concern about the potential of AI chatbots to negatively affect education, in this paper we will showcase how the power of AI can be harnessed in a positive way to decrease the disparity between underfunded and well-funded education programs all around the world. This research is important to governments, schools, students, policy makers and any other parties involved in education.

2. Underfunded Education

Underfunded education is a situation in which educational institutions or systems lack the adequate financial resources needed to sustain the desired level of functioning or meet the expected requirements. This means that the educational institution does not have enough funding to support various aspects of education, including infrastructure, supplies, extracurricular activities, technology, curriculum development, meals, teacher training and pay, and student support services (National Education Association, 2021; Obiakor, 2023; Toff, n.d.). Ultimately, a high quality of education cannot be achieved.

Research by the Global Education Monitoring Report Team and the UNESCO Institute for Statistics (2023) shows that two in three low-income countries do not meet either of the two minimum requirements (upper secondary completion rate and pre-primary education participation rate) on the funding of education. Among countries with data, 64% of low-income countries and 29% of middle and high-income countries failed to reach both benchmarks. Poorer countries also often do not report data: 24% of low-income countries and 6% of high-income countries report no data on public expenditure. These findings show that low-income countries are disproportionately affected by the underfunding in education.

Such underfunding leads to students falling behind their peers that have access to a higher quality of education, posing a setback to these students from the very beginning. It creates further inequality in the students' education on top of the already existing economic disparities as earlier stated, with detrimental effects on their future opportunities and prospects. A major impact is that the students' potential is wasted, as they are not provided a fair opportunity to truly display their academic and extracurricular potential due to limited

resources and facilities. This leaves them on a difficult path, which often leads to failure in the future.

Underfunded education also has substantial negative effects on society as a whole. The subpar quality of education leads to a less skilled workforce, as the people who are entering into employment have undergone poor training and are therefore ill-equipped to handle the task (ChildFund, n.d.). This lowers the productivity of the companies that these people work at, and by extension the productivity of their countries. The net effect of this is a weaker economy which cannot measure up to global standards, thus widening the economic divide between countries with well-funded and poorly funded education systems. The underfunding of education therefore leads to a vicious cycle in which these countries are unable to improve economically.

3. Challenges Arising from Underfunded Education

Underfunded education leads to various challenges. This section elaborates on four major challenges, namely: a lack of experienced teachers, high student-teacher ratio, lack of electronic access and an outdated curriculum.

Lack of Experienced Teachers

One of the main problems arising from the underfunding of education is the inability to hire experienced teachers. There has been a reduction in the number of teachers due to various factors such as low pay, poor working conditions and a heavy workload. (Partelow et al., 2018; Shikalepo, 2020) Schools are desperate to get teachers, hence they recruit even inexperienced ones who often have never taught before. Globally, the number of primary and secondary teachers that hold the minimum required qualifications is only 83%. (International Task Force on Teachers for Education 2030 & UNESCO Institute for Statistics, 2021) This shows the clear need for increased attention not only in the training of teachers, but also on their selection and recruitment.

Inexperienced teachers give students a suboptimal learning experience and outcome. They are unable to satisfy the intellectual needs of the students as they may not fully grasp the concepts that they are teaching themselves, and cannot answer the often challenging questions that may be brought up. This may discourage students from engaging with the teacher during lessons due to the assumption that the teacher cannot answer questions in a satisfactory manner. In addition, students only gain a surface level understanding of the content and do not get the chance to truly understand it. A negative attitude towards a teacher may also lead to hatred for the subjects that they teach.

Rural schools are especially affected by a lack of experienced teachers as qualified teachers often move to schools in urban areas which have better pay and working conditions (Shikalepo, 2020). On top of this, teachers may be overloaded with grading assignments and doing administrative work, which denies them the time to improve their teaching skills. The inexperienced teachers often are not used to the conditions in rural areas, such as isolation from certain services and a severe shortage of instructional resources.

High Student-Teacher Ratio

The global average pupil/trained teacher ratio (PTTR) in primary education was 27:1 in 2021 (International Task Force on Teachers for Education 2030 & UNESCO Institute for Statistics, 2021). This is in stark contrast to the 56:1 in sub-Saharan Africa. There is no universal definition of what constitutes a large class, so we will define it as those with a specific number of students that teachers cannot handle and resources that are not enough to facilitate the teaching and learning process (Bahanshal, 2013). The high student-teacher ratio brings about an onslaught of problems to both the students and teachers, the most impactful of which is a severe lack of individual attention. Students receive limited feedback from teachers, giving them little room to learn from their mistakes and grow. Interaction is an integral part of learning. This limited support has detrimental effects on the student, such as low motivation. The students often have no real motive to work as they do not receive encouragement or guidance. A lack of motivation is extremely dangerous to a student because it makes the student view school as a chore rather than viewing it in a positive light. This bars them from unlocking their potential and discovering their passions. Large classes also lead to less participation, as the teacher is unable to accurately gauge who is and is not participating, such as those who hide by sitting at the back, and does not have the time to enable each and every one to speak and participate in class. In the process, shy or weak students are left behind. A large class size leads to ineffectiveness of activities due to the sheer number of students as it is difficult to manage each one. Students thus lose concentration and do not achieve the intended result. It may also be extremely difficult to manage the class as disruptive students can easily get away with it. A lot of time is wasted in trying to deal with disruptions such as noise and general disturbances, leaving little time for the actual delivery of content. There is a lack of control over the class, which gives the students a false sense of freedom and opportunities to interrupt the class without repercussions.

Large classes are a challenge to even experienced teachers, let alone the inexperienced ones that underfunded education often has. They can therefore frustrate teachers and demotivate them from trying their best to educate and motivate their students.

Lack of Electronic Access

Students who undergo underfunded education have a glaring disadvantage compared to students in well-funded education due to their access to few or total lack of access to electronic devices such as computers, tablets and mobile phones. In the event that they do have access to electronic devices, the internet is often very weak, low quality, or totally absent. They therefore cannot fully exploit the devices, limiting their access to various opportunities, a positive academic enrichment and networking (Giving Compass, 2021). Thus, a digital divide is created between those in underfunded and well-funded education. The digital divide is the gap between those who do and do not have access to computers and the internet (Dijk, 2006). It has far reaching effects on the students whose education is underfunded. For instance, students perform worse as they have less access to resources and information that would help to advance their education. They spend more hours completing learning objectives than their counterparts with access to technology, and consequently learn and understand the same amount of material at a decelerated pace. With the large amount of coursework required for students to undertake, it may lead to high stress levels, and may discourage students from taking more technical and challenging courses. Students undergoing

well-funded education have a competitive edge at the university level due to the increasing embracement of technology in education, which also makes them more marketable in the corporate world. Generally, technology streamlines the experience of education as it removes many of the hurdles on the path to successfully completing an academic program.

The digital divide further widens the already large gap between social classes. The internet typically has the effect of levelling the playing field between the social classes, as it provides high quality content and learning materials for free. Therefore, the limiting factor of a lack of access to information is removed, giving students a much better fighting chance. When the internet cannot be accessed by these students in underfunded education, it becomes a tremendously constraining factor to their academic growth. While more privileged students continue to advance and grow their knowledge at an accelerated pace due to their access to the internet, the students without access are left behind. The lack of access to electronic devices and the internet has a ripple effect on other aspects of life, not just education. These students often proceed to lower paying jobs as they are not as skilled or qualified as those with good internet access, further exacerbating existing economic disparities. There therefore is a clear need for access to the internet in this ever-evolving world.

Outdated Curriculum

Underfunded education faces the problem of an outdated curriculum due to the limited resources allocated to curriculum development. The curricula in underfunded education are very rarely updated to include the new discoveries that continue to be made in various fields. Thus, students are often learning content that was relevant many years ago, which may have since been disproven, amended or greatly improved. They have limited exposure to current events and pressing issues of our time. They may therefore miss opportunities to develop the critical thinking and problem-solving skills necessary in tackling the problems faced in today's world.

When curricula are outdated, they may fail to incorporate innovative or emerging technologies and teaching methods that could enhance the learning experience for students. This hinders the development of new and more effective approaches to teaching and learning. Students miss out on opportunities to learn and apply new techniques, strategies, and tools that can help them succeed in their academic and professional lives. As a result, they may struggle to keep up with the demands of the rapidly evolving world and fall behind their peers who have access to more modern and effective educational resources. Students may learn skills that are no longer in demand, thus hindering their chances of employment as employers seek a different set of more relevant skills not taught in the classroom. They are therefore less viable in the job market and have a harder time finding a job. Outdated information may also have inconsistencies that teachers cannot explain to students, thus discouraging students from attempting to gain a deeper understanding of certain concepts and teaching them to simply accept new information without interrogating it. This complacency is damaging to the student as it discourages the deep exploration and mastery of content, teaching them to memorise rather than understand.

Students are in a time capsule of outdated information, leading to a great shock when they explore the bigger world and realise that what they have learnt is largely irrelevant (Matter & Form, 2019). An outdated curriculum is disconnected from current world contexts and fails to equip students with the knowledge and skills they need to navigate and thrive in the modern

world. They then have to spend time updating themselves with current information, disadvantaging them as other students with up-to-date curricula advance far ahead socially and economically.

4. Artificial Intelligence

AI does not have a single concrete definition that is universally accepted. For the purposes of this research, we will define artificial intelligence as the development of computer systems and machines that can perform several tasks that would require Human Intelligence (HI) such as learning, solving problems and decision making (Chen et al., 2020). It also involves the use of algorithms and data to enable machines to simulate intelligent behaviour and adapt to different situations.

In the past few years, interest in AI has spiked due to the popularity of cutting-edge research done by companies and scholarly institutions alike. For example, the AI research company OpenAI is making strides and pushing the limits of the development of artificial intelligence. With the release of GPT-4, they have demonstrated the extreme potential of AI to revolutionise human life as we know it. Its remarkable ability to reason, understand and synthesise coherent and accurate information has brought AI into the limelight. ChatGPT, a chatbot made by OpenAI, reached 100 million users only 2 months after its launch, clearly demonstrating its outstanding demand and utility (Hu, 2023).

AI has many diverse uses, such as in search engines, autonomous vehicles, and even smart toasters. For example, AI has achieved remarkable progress in the field of healthcare. It has contributed to disease diagnosis, drug discovery and personalized medicine. By use of machine learning algorithms, AI can effectively analyse extensive medical data hence enabling doctors to make precise and accurate diagnoses and treatment strategies.

Despite the incredible benefits that they bring to the table, artificially intelligent systems have their drawbacks. AI often produces completely false information conveyed in a convincing manner, called “hallucinations”. Items such as references and citations are often completely made up. The cause of these “hallucinations” is difficult to establish (Lutkevich, 2023). They are hazardous because they can easily fool people, causing the spread of misinformation. Due to the newness of large language models such as ChatGPT, people are likely to believe it as they may not know about the phenomenon of hallucination. They also betray the users’ trust who previously believed AI to always be accurate, discouraging them from using it.

AI also has implicit biases (Silberg & Manyika, 2019). Training data that the AI learns from may have biases which are reflected in the AI’s output, further reinforcing harmful stereotypes. Bias may be in subtle forms, such as an AI system giving a student who writes an essay about a difficult socioeconomic background a lower score than one who writes about a different topic. This bias compromises the holistic nature of education. It may be ingrained deep in the training data and show up in a not so obvious way. While this may not have been the developer’s intention, it is still a very important concern if widespread use of AI is to be achieved. Much work needs to be done to improve on this, such as by choosing training data more selectively and through auditing of models and data by third parties.

5. How AI Could Address the Problems in Underfunded Education

AI has the potential to significantly mitigate the problems in underfunded education outlined above. These is outlined in the following sections.

Aid to Inexperienced Teachers

Artificial Intelligence would be an instrumental tool in not just aiding teachers in the classroom, but also teaching the teachers themselves. It could be used in the initial training of teachers, delivering pedagogical knowledge on optimal teaching methodologies and improving content comprehension. Additionally, AI models can serve as practice students for new teachers (Chen, 2023). They have the ability to simulate confusion and ask follow-up questions like a student, preparing the teacher for the real experience. AI tools can be used to help design lesson plans which align with the curriculum requirements and with class activities that better engage students. This is a useful feature that could support teachers in developing effective lesson plans that are engaging and pedagogically sound. The AI can serve as a source of inspiration for the teacher, such as by suggesting different ways to deliver a certain concept and thus the teacher can decide which best suits their style (Nieves, 2023). AI can also provide live feedback in a lesson, suggesting questions to ask students and actively advising the teacher based on proven pedagogy. This can help a teacher to build intuition on what to do in various situations, acting as a live mentor during the lesson. After the lesson, AI can produce a summary, capturing various metrics such as how much time students spoke for and questions that led to the most engagement. This data is useful for the teacher for future improvements in the learning experience for students. It also helps the teacher develop their own unique style of teaching, which sets them apart from other teachers and gives their lessons a sense of personalization.

However, caution must be taken in the direct use of AI in the teaching process. Measures must be put in place to avoid AI automating bad ways of teaching rather than improving the teaching (Chen, 2023). Doing so is crucial for the actual use of AI tools in the classroom. We must also remember that AI is just a tool and does not guarantee success, effort still needs to be put in by the teacher to provide effective instruction (Wilichowski & Cobo, 2023).

Mitigating the High Student-Teacher Ratio

An incredibly useful AI tool that would take some load off teachers is the Intelligent Tutoring System (ITS). An ITS tracks various psychological qualities of a student through a process called student modelling. It then responds based on the psychological state with activities and exercises that are appropriate for the student's capabilities. ITSs have the ability to perform repetitive, non-cognitive tasks such as grading and administrative tasks. Therefore, teachers save time and have a reduced workload, thus they can use their time more productively to build positive relationships with students, hone their teaching skills and give students more personal and quality instruction (Wilichowski & Cobo, 2023).

A key benefit of ITSs is that they give students individual attention through personalised feedback based on the student's performance in a certain topic. Students also learn at a pace that is suitable for them. This way, smart students do not feel unchallenged or held back by the rest, while slow students are not left behind. Students can deeply understand the content. This is especially important in underfunded education, because it takes some load off the

teachers who physically cannot give each student the full attention required for optimal learning.

Students feel more motivated to learn and progress as they are taught in a manner tailored specifically to their needs, so learning does not feel like a burden. The ITS tests various teaching tactics and decides on the best one for the student. It can make connections between the students' likes and the concept that is being taught. This is also likely to improve student performance as participation in class is guaranteed, whereas in the status quo of large classrooms, some slow or unmotivated students may blend in and never participate. Students are also often discouraged from openly asking questions during class due to the fear of judgement by their peers (Chen, 2023). In particular, slow students are the most affected by this as they fear being labelled as 'stupid' by their classmates. This becomes a positive feedback loop in which the student never really gains understanding and does not improve even with time. An AI system would remove the barrier of self-consciousness; thus, the learner is more willing to be vulnerable and engage. Constructive remarks such as "That is a good question!" by the AI could also help to boost their self-confidence.

AI as an aid in creating lesson plans would also be very useful to support the large classes that characterise underfunded education. AI can suggest effective collaborative exercises for the large number of students to work together, further improving their understanding of a subject while also dividing the class into smaller groups which are easier to monitor.

A good example of the effectiveness of AI tools in education is Khanmigo, a tutoring AI that is powered by OpenAI's GPT-4 technology. It has the ability to prompt and give hints to the student to encourage them to find the answer on their own, without the AI explicitly giving the student the answer (Golden, 2023). It does this by asking the student how they came up with a solution and showing where they went wrong, developing the student's critical thinking skills. It also records a summary of the student's progress for review by teachers and parents (Ofgang, 2023). The Khanmigo AI can also simulate various historical figures and fictional characters, bringing stories about them to life and leaving a lasting impression on the student as they can seemingly interact with them (Singer, 2023). Khanmigo is also of great help to teachers as it can develop lesson plans and assist with administrative tasks (Ofgang, 2023).

Though the high student-teacher ratio may not be eliminated, it becomes lot more manageable through the implementation of AI.

Curriculum Development

Artificial Intelligence can be leveraged to update curricula and bridge the educational divide between adequately funded and underfunded education. In the initial development of a curriculum, AI can act as a good starting point by providing ideas for content alignment (McGehee, 2023). It can create course objectives, give an outline of the subtopics in each unit and generate lesson plans of which topics to cover in each lesson. AI could also assist in the generation of questions that closely align with the content and that challenge the students' understanding.

AI would be excellent in continuously updating of curricula to maintain their relevance and alignment with current knowledge and societal trends. Machine learning algorithms can be utilised to analyse vast volumes of data such as research papers, articles and scientific

publications. This analysis can be used to identify breakthroughs and emerging issues, notifying the curriculum designers who can then determine their appropriateness for inclusion. By implementing these insights, curricula undergo continuous refinement, providing students with the latest well-curated content and skills that effectively meet the demands of the modern world.

However, we must remember that AI is just a tool and cannot replace the expertise of curriculum designers, it should be used only as a supplement to their work. Human experts are still needed to refine the content, but are better with AI.

6. Implementation

So far, we have mainly explored the potential that artificial intelligence promises in the improvement of underfunded education, but we have not seen whether this would actually be possible. This section looks into the feasibility of implementing AI in underfunded education and the measures that would have to be taken to ensure its effectiveness.

Firstly, we must establish how these underfunded areas would access electricity. Around the world, 775 million people lack access to electricity, most of whom are in developing Asia and Sub-Saharan Africa (Cozzi et al., 2022). This has disrupted various areas such as healthcare, communication and industries. The lack of electricity negatively affects underfunded areas in all respects and stunts their economic and social growth, and is an issue that must be addressed for prosperity. To supply electricity to such areas, off-grid solutions such as solar or hydroelectric power may be used (Heinz, 2014). Alternatively, microgrids can be set up where it is cheaper than extending the main grid. Energy-efficient appliances should also be used to maximise efficiency in electricity usage (Odarno, 2017). Additionally, access to electricity should be linked to development goals, as they are interdependent. Development is hindered by a lack of access to electricity, while electric access is reliant on successful development projects. If development projects partner with electric access initiatives, planners can utilise the expertise of developers and finance organisations to accelerate the electrification of these areas. We must also guarantee the affordability, reliability and high quality of electricity for development to take place. This could be achieved by subsidising the cost of buying electricity. The burden falls on governments to continue availing electricity in remote and underfunded areas to reap the benefits of economic development and improvements in education.

Next, we look into how underfunded education would gain access to the technology required to run the AI programs. Governments can partner with technology manufacturers to buy efficient and affordable devices for education in bulk. For example, tablets or all in one desktops can be used. Though implementing AI in poorly funded schools may seem difficult due to limited resources and capital, it is not impossible. AI-powered educational applications can be developed to run on low-cost devices such as smartphones or low-end computers that are more affordable and accessible to poorly funded schools. Since internet connectivity may be limited in some poorly funded schools, offline AI solutions can be employed. Of course, these devices would have to be periodically updated with the newest developments, but this is easily achieved by transporting them to areas with internet access or by downloading newest

AI programs to a portable storage medium such as a flash disk and availing them to the areas without internet access.

A key part of the puzzle of implementing AI in underfunded education is the training of all parties involved to be able to use it effectively. Firstly, teachers must be trained in order to understand how to apply it in their daily work and help students use it. Some of the teachers may not even be computer literate, thus a lot of effort must be put into such training for it to bear results. The training can be through means such as seminars and workshops to educate the teachers on the effectiveness and utility of AI, as well as how to use it themselves. These training programs will have to be very rigorous, as the teachers will be the primary tutors to their students on the use of AI. Teachers will also need reassurance that AI will not replace them or steal their jobs. Overcoming this doubt requires effective communication, awareness campaigns, and demonstrating the positive impact of AI in education.

In addition, teachers must be convinced that AI will not make their students lazy. For example, AI can write entire essays, which the teacher might feel is a form of cheating. On the contrary, AI might actually end up heightening writing standards, as AI will not be doing the thinking for the students. Students will have to curate and edit the content, which makes them investigate the subject matter much more deeply than they previously did (Chen, 2023). This could end up actually improving their critical thinking skills, rather than decreasing them.

To educate the students, expert guest speakers can go to each school in which AI is to be implemented and give the students a brief presentation on AI and its benefits. For long term maintenance and to ensure that the adoption of AI technologies goes smoothly, a designated tech support person can be situated in each school.

It must be noted that only one AI system is required to cater for an entire education system, therefore all the time, energy and resources can be put into making that one AI system as good as possible. This can be achieved with the help of experts across the world who are well-versed in the AI development, as well as the most experienced local teachers who fully understand what the education system requires. This guarantees a somewhat equal playing field between people in underfunded schools and well-funded schools. The creation of one AI program for an entire education system could also encourage international cooperation in education in which different countries exchange ideas about their education systems to improve them. Eventually, the possibility of a universal curriculum may be realised.

While the implementation of AI may seem costly, its long-term benefits far outweigh the short-term challenge of initially funding the buying of devices and development of the system.

7. Conclusion

Artificial Intelligence has incredible potential in revolutionising underfunded education. It is producing new teaching and learning solutions that are being tested globally. By harnessing the power of AI, education systems can create more equitable and engaging learning environments while empowering teachers to grow and develop professionally. If AI were implemented in underfunded education, it would decrease the educational divide between

countries, giving all students an opportunity to display their full potential. However, much work still needs to be done on improving AI models and optimising them for education systems. As the world continues its rapid evolution, we must ensure that underfunded education does not get left behind as the rest of the world pushes forward and develops. In this paper we have demonstrated its potential to effectively address four major deficiencies arising from underfunding in education. It is doable and necessary for a more equitable and fairer world, governments, education institutions and their partners should therefore take seriously the open opportunity presented by AI to managing the challenge of underfunded education.

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Artificial Intelligence meets Education: Defining the Future of Course Predictions

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Abstract

In education, one of the greatest setbacks faced by students is failure, the inability to pass a course and successfully receive credit. As a means to help curb this issue, artificial intelligence technology has emerged as a way to understand the performance of students throughout previous and current courses as well as what they struggle on or excel at, allowing for a better window into the risk of failure in certain educational scenarios. Indeed, AI's usage in the educational system is a promising way of telling whether a student is at risk of failure in a course that could be on the way to provide ways of improvement to students who might otherwise fail.

Keywords: education, artificial intelligence, predictions, risk, failure.

A.I. (Artificial Intelligence) is the ability for a computer to be able to do intelligent activities similar to a human. A.I. has been around since the 1950's. It all started when an article was published by Alan Turing in 1950(A. M. Turing (1950) Computing Machinery and Intelligence. Mind 49: 433-460.). It talked about the basis of computer learning and the idea of it having a conscience. Alan Turing was ahead of his time, however, and due to this he was never able to foresee an A.I. as complex as he imagined. However, since the 2000s, his ideas are starting to come to life and A.I. is slowly forming into an implementable idea in today's society. While A.I. has opened humanity up to a new era similar to the industrial revolution, it has not come without its controversies. Controversy is normal with newer ideas, as they have not been regulated due to the earliness of its use. When cars were first implemented in society there were no seatbelts or traffic signs or any safety precaution whatsoever. With time, however, people started to see problems with the raw car and started adding and restricting aspects to it.

We believe A.I. has a ton of potential just like the rest of the world. We believe it can fit into the modern learning curriculum with a few adjustments, like a seatbelt with the car. Many kids from low income communities don't have the monetary assets to afford a tutor. So we propose the creation of an A.I. that tests the needs of the kid and stores it somewhere. We will base it off of free platforms such as Khan Academy, but students' questions and needs will be addressed by the A.I.. This program will essentially be youtube google and Khan Academy combined into an A.I. program.

In education, one of the greatest setbacks faced by students is failure, the inability to pass a course and successfully receive credit. When students fail, it is very likely that preventative measures could've helped in avoiding the occurrence and that this could be detected ahead of time. However, a teacher can't address all of these problems at once. AI, however can; Through AI, students can receive the necessary aid they need to prevent it. Not only would this save the student time and money, but also further their educational goals and provide them with resources available if they are struggling and at risk of failure.

Through the careful consideration of sources, we found multiple sources which directed us to the idea that machine learning can detect when a student is on track to fail, such as the article Pre-course Prediction of At-risk Calculus students by Cunningham et al.

Multiple studies have explored the possibility of providing ways of improvement to students by using AI technology to infer where they may lack, and therefore what interventions they may need the most. Other studies focus on KT, or knowledge tracing, allowing for the tracking of what students are well versed in and vice versa, through the use of neural networks, such as the study by Geoffrey Converse, Shi Pu, and Suely Oliveira titled "Incorporating Item Response Theory into Knowledge Tracing." Using this data, A.I. could be used to determine the strengths and what students are lacking in, as a way to provide ample support for where students need it the most. There are many variables which can be introduced to the prevention of failure in classes, which is something that a study titled "Predicting Success, Preventing Failure" by Danny Glick, Anat Cohen, Eitan Festinger, Di Xu, Qiujie Li and Mark Warschauer dives into by introducing an experiment which factors in not only fitness but also behavioral qualities in asynchronous classes, finding that disciplined effort could help in prediction of class outcomes and other factors such as the student's beliefs

about peer learning. Additionally, ethical questions also arise during the use of A.I. to distribute support to students.

The research could be extended in the future to predict students' long-term academic standing rather than their standing in a single class. Using the data from multiple cumulative courses and other factors over time can help educators better support students over their whole learning career rather than a single class. Artificial intelligence models, especially those based off of real life data, are at a high risk of containing vast biases. These models may be unfair to certain demographics or types of students that lack enough data to accurately predict. Future research can develop and extend ways to mitigate potential biases and confirm fairness in the implementation. Future models could benefit from growing AI research.

Things like refining algorithms and adopting new techniques could be used to enhance the accuracy of models that predict student failure and ways to help them. There is great potential for Artificial Intelligence to aid educators in identifying students who are struggling or at risk of failing a course. These AI systems analyze information from various sources such as placement tests, surveys, and student information systems, the systems can then utilize this data to provide insight into students' areas of strength and weakness. Ultimately this information can be used to develop interventions and other support mechanisms to help students who are struggling and improve their chances of success in those areas.

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Exploring the Role of AI in Education

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Abstract

New advancements in machine learning and AI can be used to augment student learning and teacher capabilities. Examples of AI approaches in education include generating personalized student recommendations, autograding essays, and improving educational resources. AI programs intended to improve education can be categorized informally into three groups according to purpose: Guidance, Student, and Teacher. “Guidance” means the AI helps users make decisions such as helping a student decide what topic to study. “Student” means the AI helps students absorb information and apply it, such as an AI math tutor. “Teacher” refers to AI that assists the teacher in teaching. These categories are general and not necessarily mutually exclusive, but provide a framework for organization and further development. Using these groups, past AI approaches can be analyzed and compared to find common principles that reappear across development. Since AI in education is a multidisciplinary field, it is advantageous to organize current approaches so that those unfamiliar to the field can get a general understanding of the different types of approaches. This paper intends to look at the past approaches of AI to improve education and how they can be categorized to guide new development. Additionally, this paper also looks at potential drawbacks and solutions, such as ethics concerns, cost, or lack of human-interaction. By analyzing the past use of AI in education, this paper seeks to provide a grouping framework to improve understanding of the field and facilitate efficient and holistic development.

Keywords: Guidance, Student, Teacher

Introduction

Artificial Intelligence (AI) is the ability of computer systems to mimic human cognitive functions such as learning and problem-solving (Artificial Intelligence vs. Machine Learning: Microsoft azure, 2020). Similarly, machine learning uses data to help computers learn. Though the terms are closely related, they have different meanings. With the release of accessible AI technology such as ChatGPT, it is increasingly important to consider how AI can affect and improve education. The impacts of AI on education can be loosely categorized into “Guidance,” “Teacher,” and “Student” to more easily consider their benefits and drawbacks. By categorizing past AI approaches in education, new approaches can be developed with a clearer focus. As AI continues to advance and spread, it is useful to have an organizational structure to make informed decisions about its implementation and implications for the future of education.

1. “Guidance” AI Approaches

“Guidance” AI is used to loosely refer to AI programs that assist students and teachers in making decisions. They provide data-based advice and help to improve access to educational opportunities and help decide which ones to pursue. Though not necessarily in the realm of teaching or learning, they can have powerful effects on improving education. For example, through “guidance” AI, we can analyze data to connect disadvantaged students with educational opportunities to decrease educational disparity. Below are examples of such programs.

1.1. Teacher Recommendation System

AI was used to power a teacher recommendation system for online students and teachers (Chen et al., 2021). In online one-on-one courses, recommendation systems play a key role in properly matching teachers and students. Teachers and students need to be properly matched so that there are less scheduling and social conflicts. Reviews and ratings from former students may be noisy and unreliable, making reviews an ineffective recommendation system. To improve recommendations, the AI analyzed data from the academic histories of teachers and students to predict which teachers and students had good compatibility with each other and used it to recommend certain teachers to certain students. The AI also boosted new teachers in the recommendations systems to help give experience to new teachers. The recommendation system resulted in a decrease in average matching attempts from 7.22 to 3.09 over a five month period. The decline of matching attempts suggests that the new matches were more satisfactory and less students wanted to change teachers.

1.2. Identifying At-Risk Students and Giving Intervention

In a study, AI was used to predict students at risk of failing to provide intervention (Hlosta et al., 2021). The study uses predictive learning analytics (PLA) to predict student outcomes. The predictions are used to identify which students are at risk of failing so that the teacher can reach out and provide intervention. Students who got intervention had higher chances of passing. The study also found that disadvantaged students such as those in poverty or of minority groups benefited more from intervention (Hlosta et al., 2021). Though the study

needs to be replicated at a larger scale, it demonstrates the potential for AI to close educational gaps and promote accessible education.

1.3. Informative Actionable Feedback

AI was also used to help students decide what actions they should take to improve their academics. Researchers developed a machine learning program that used data from the learning management system (LMS) to predict academic performance (Afzaal et al., 2021). Then, the predictions were used to automatically generate actionable feedback a student could follow to improve academic performance, such as learning resources they could review or assignments they should do. This approach generates feedback using a technique called counterfactual explanations which predicts what actions if taken would improve the AI's predictions the most. These actions then become feedback for the students to use. This helps students self-regulate their learning and personalizes it so it's more efficient.

2. "Student" AI Approaches

"Student" educational AI refers to the combination of AI technologies and educational principles to improve education quality, such as by making learning more engaging or functioning as a more accessible and personalized teacher. Examples of "learning AI" may include intelligent tutoring systems, game-based learning, or learning analytics. They focus on the student-side of education and aim to help students understand, retain, and use the knowledge they are presented with. For AI to be most effective at improving learning, it is important to follow educational principles of learning and associated research. The following paragraphs are examples of "Student" educational AI.

2.1. ALEKS Progress Checks

ALEKS is an online educational program, specializing in teaching STEM. It teaches its students "topics" and later assigns progress checks to test for learning. Progress checks are important because they check if a student has retained what they learned. However, according to student feedback, users of ALEKS preferred learning new material over progress checks (Adams et al., 2021). Moreover, researchers noticed students experienced "assessment fatigue" and were less likely to answer a question later on a progress check (Adams et al., 2021). To improve the progress checks, researchers used AI to predict which topics were likely to be forgotten and should be included on the progress check. They then used these predictions to optimize which topics the progress checks decide to test for in order to improve learning gain. They defined learning gain as topics that were remembered in the progress check. They analyzed two groups of around 150,000 students in 2019 before the new progress check and in 2020 after the new progress check and found a 9% learning gain increase from 2019 to 2020, which may be especially significant due to the COVID-19 pandemic (Adams et al., 2021).

2.2. Game-Based Learning

According to the Entertainment Software Association, 65% of Americans, or 212.6 million, play at least 1 hour of video games a week (Pierre-Louis, 2023). Using the widespread appeal of video games, educators can combine game-elements and education to create a more

interactive and engaging learning experience. Educational games use elements like badges, points, plotline, quests, and more to guide students through learning activities, give immediate feedback, or simplify learning content to manageable tasks (Kirchner-Krath et al., 2021). For example, educational games may use elements such as a plotline, in-game rewards, or appealing aesthetics to increase student engagement and interest in learning. AI could add new capabilities to such games by powering interactions with human-like NPCs (non-player characters), adapt gameplay based on the student, and collect data for learning analytics. One game includes Crystal Island, a microbiology game-based learning environment where learners have to diagnose a disease infecting people on an island. The plot of the story is able to adapt to the student in response to plot goals and the student's current interactions and progression in the game (Rowe et al., 2009). For example, based on the information the student has received, such as clues or character dialogue, the AI can predict the student's goals and adapt the plot if needed (Dever et al., 2021). This means students can self regulate their learning with accessible adaptive support when needed (Goslen et al., 2022).

3. “Teacher” AI Approaches

“Teacher” AI refers to AI technologies that help the teacher teach. In this case, AI functions as a complementary tool to the teacher through functions such as increasing time spent on teaching by outsourcing redundant tasks or expanding the methods a teacher could use to teach more flexibly. Examples may include automatic grading or the use of new teaching methods made possible through AI. Below are some example approaches.

3.1. Essay Autograder

Automated essay scorers use AI techniques to score essays. To do this, they use machine learning and natural language processing to score essays without human intervention. AI models recognize patterns from previous human-scored essays to determine which essays are higher quality. Though an AI model can't truly understand why an essay is good or bad, and may miss nuances and context, they can use statistical patterns observed in previous high-scoring essays to predict the correct scores. Additionally, essay autograders can be further improved such as by using item response theory to average multiple automatic essay scorers (Aomi et al., 2021). By using an essay autograder, teachers can reduce the time needed for manual grading and spend more time on interacting with students. Furthermore, future essay scorers could expand their capabilities and learn to provide personalized feedback to make essay writing and free response less labor-intensive to grade.

3.2. Inq-Blotter Teacher Dashboard

Inq-ITS uses AI to analyze student responses and engagement in an online lab. It monitors the students' progress as they complete the lab in real-time and predicts when they need help (Dickler et al., 2021). If a student is stuck on a problem or concept, the AI can detect it and alert the teacher to offer their assistance. This technology helps teachers more effectively identify and teach struggling students, which helps ensure the entire classroom progresses without leaving some students behind.

4. How Grouping is Helpful

Categorizing AI approaches in education can help boost safe and effective development. The groups "Student," "Teacher," and "Guidance" were suggested in the context of AI in education. "Student" refers to approaches that help learning, "Teacher" refers to approaches that help the teacher teach, and "Guidance" refers to approaches that help manage academics. These groups can provide a framework for understanding how AI approaches can be used in education, which can facilitate improvements of AI in education.

4.1. Generalization

Firstly, grouping the uses of AI in education allows generalizations to be applied to groups of AI approaches. For example, "Student" and "Teaching" AI approaches are both directly a part of education, which means AI approaches to improving student learning or expanding a teacher's capabilities should be grounded in cognitive science or educational research. "Guidance" AI is more related to management and can involve functions like adaptive scheduling or study recommendations, meaning insights from management research may be more useful. These generalizations may allow knowledge transfer from different fields to occur more easily. Since AI in education is multidisciplinary by nature, grouping AI approaches can help different fields collaborate.

4.2. Targeted Development

Grouping the uses of AI in education can also promote targeted development. Using groups identifies common goals and challenges within each category, meaning it is easier to anticipate problems and develop solutions. For example, an personalized AI tutor could provide quick and accessible responses, but may prevent the student from thinking independently. Additionally, it is easier to find past approaches similar to new AI approaches by looking within a category, which can help provide inspiration and insight to development. There are other possible methods of categorization, but the central idea is that AI in education is inherently multidisciplinary, so an organizational structure is essential to foster collaboration and development between AI and education.

5. Drawbacks of AI Implementing AI in Education

Though AI has a large potential to improve education, there are still many limitations and drawbacks that weaken its ability to safely and effectively benefit education. Its limitations include factors like cost, privacy, ethics, lack of explainability, or reliance on accurate data. These limitations can make AI be too costly for its benefit or potentially harmful by invading privacy, which can reduce the feasibility of implementing AI or make it unsafe or unwanted to do so.

5.1. Lack of Human Interaction

If AI replaces functions typically done by humans, such as teaching and grading, we may lose the benefits of human interaction. Though AI is capable of personalizing feedback and education, it can't completely replicate the relationship between teachers and students. In many cases, AI may not be as flexible as teachers in personalizing feedback and adapting their teaching methods. Teachers have access to more information and can observe body

language and facial expressions to understand if their explanations were effective. Teachers can also fulfill emotional and social needs of students by providing encouragement or creating a friendly learning environment. Additionally, acquiring knowledge for the class is only a part of education. Educators also foster morals, ethics, conscientiousness, and resourcefulness in students (Ghafar, 2022). These important aspects of education can't be fully replicated by AI. Human teachers have the ability to promote critical thinking, facilitate discussions, and promote values beyond academics.

5.2. Privacy, Data Security, and Ethics Considerations

When AI is used in educational settings, there are potential concerns of misuse of data. Since AI is a new and rapidly growing field, there is not much history or precedent in regulating the field. The first comprehensive set of AI regulations was the European Union's AI Act in 2023 (EU AI Act: first regulation on artificial intelligence, 2023). Many people may be against the collection or sale of their data and may not support the addition of AI, so experts need to be hired to develop proper guidelines to protect users of AI, resulting in additional costs. According to Salary.com, the median entry-level cybersecurity analyst makes is 77,592 dollars (Entry Level Cyber Security Analyst Salary in Houston, Texas | Salary.com., 2019).

5.3. Reliance on Accurate Data

AI relies on data, so the amount and quality of data the AI has access impacts its effectiveness. When there is not enough data or certain data values are overrepresented, AI can spread and empower harmful biases. For example, an automatic essay checker may give lower scores to unorthodox essay styles even if they were effective because there is not enough data. Systems need to be developed to monitor possible biases or faulty outputs from AI (Khan et al., 2023). This means the data students learn may be biased and incorrect and further spread those biases.

5.4. Lack of Explainability

AI suffers from lack of explainability. Though developers know the data they input and the conclusions the AI reaches, they don't exactly know how it reaches those conclusions due to the complexity of the algorithms. AI has been referred to as a black-box, where we have little understanding on how the AI performs its functions (Chowdhury et al., 2012). This can make AI hard to manage, for example if it is promoting biases that need to be corrected. It is harder to correct AI if developers don't know what went wrong. AI also becomes less effective if it can't be explained. In the context of education, if a student asks an AI how it solved a math problem, it might not be able to explain it properly and the student would know the answer but not the explanation.

5.5. Lack of Contextual Understanding

AI's contextual understanding may be limited compared to a human. AI can find patterns in data but it doesn't understand why that pattern occurred, which limits its ability to draw accurate conclusions in new contexts (Hoffman, 2023). Also, AI training tends to be for a specific task and context, which may prevent it from effectively being applied to new context. For example, much of learning occurs in the context of previously learned topics. Teachers build upon their previous lessons, but AI may find it difficult to personalize learning with the quality of a human teacher.

5.6. Cost

AI can be expensive because it requires significant computational resources and time, which can limit schools from using it. AI requires a costly computer investment and high quality computer systems to run their programs. Additionally, personnel need to be hired to maintain and improve the AI infrastructure. Latitude CEO Nick Walton, who made the game AI Dungeon, remarked that they paid about as much for AI and humans (Vanian, 2023). Investing in AI education will require a big budget that many schools may not have or are unwilling to invest in the new technology.

5.7. Loss of Soft Skills

By relying on AI, both teachers and students may lose their soft skills, which are generally skills that can be used across many different contexts. Soft skills include time management, leadership, creativity, and more. While AI can attempt to teach such skills or facilitate their development, many soft skills develop only in the context of human interaction, which is difficult for AI to imitate. It is generally accepted that soft skills cannot be learned passively (Caeiro-Rodriguez et al.). Therefore, it can be said that human teaching is a more effective method of teaching such skills than AI, since the teacher and student are physically interacting. Additionally, many soft skills are generally useful in the context of human relationships, so it would be difficult for an AI to simulate the growth of soft skills like socialization and cooperation.

6. Implementation & Accommodation

Though AI is expensive and has some limitations, its rapid development and growing range of applications make it widely used across many sectors. AI has its limits, but based on the trend of its advancement, these limits may be removed in the next decades. Since AI has the potential to transform many tasks, many fields have already started to use AI and education will likely follow. Major problems of AI in education include ethics, effectiveness, cost, and a need to be human-centered. Key objectives for implementing AI in education are making it safe and effective, which include measures like ethical guidelines, developing new technologies based on educational research, and training to handle AI. Below are some factors educators need to consider when implementing AI.

6.1. Privacy, Data Security, and Ethical guidelines

AI uses large amounts of data, which may be collected from students and teachers. To prevent misuse of data, regulations need to be put on what data AI can collect and whether users should be informed that their data is being used. Since users of educational AI will include students, who are too young to comprehend how their data is being used, regulations may need to be stricter to prevent misuse of data. Regulations on AI could be modeled after other ethics guidelines like the EU AI Act (EU AI Act: first regulation on artificial intelligence, 2023). Most existing AI guidelines have emphasized principles such as transparency, justice and fairness, non-maleficence, responsibility, and privacy (Jobin et al., 2019). These principles can guide the development of schools' AI regulations and students, parents, and teachers can sign forms acknowledging how AI will be used.

6.2 Educational Principles & Direction

AI in education will need to be based on educational principles from teachers and education research studies to ensure they are effective in improving education. Oftentimes, partnerships between AI and humans fail due to lack of human-centered design (Holstein et al., 2019). For example, if the teacher isn't able to usefully interpret what the AI is telling them, then the AI is ineffective. Even if AI is introduced into education systems, it doesn't necessarily mean education will inevitably improve, so it's important to develop AI to complement people's abilities. To promote human-AI synergy, AI developers need to involve direct practitioners like teachers and focus on combining strengths of humans and AI (Holstein et al., 2019)

Additionally, education powered by AI should prioritize learning skills that are still needed in the future. Some fear robots and AI will replace many jobs. To remain relevant, future workers need to be innovative and creative (Rampersad, 2020). As AI becomes more developed, it will get better at the tasks it can mimic from humans, so tasks it can't mimic yet like creativity and critical thinking will rise in importance. "Though most people are aware of the value of critical thinking, it lacks emphasis in curricula" (Spector et al., 2019). Educators need to focus on teaching students the skills that won't become obsolete as AI advances and takes more jobs, meaning skills like critical thinking and creativity are especially important to teach.

6.3. Digital Literacy

AI can be a powerful tool, but it needs to be used properly. Holstein et al. notes some human-AI partnerships fail because humans aren't able to use the AI due to the person not having necessary knowledge or the AI not being developed properly (2019). Since AI in education is new and unfamiliar, both teachers and students will need training and experience to use it effectively. Without training, teachers and students may waste valuable time trying to adapt to the technology. Educational AI is meant to facilitate education, so it would be ironic if teachers and students spent more time figuring out how to use the technology than learning or teaching. Additionally, AI may become a core component of future industries or workplaces, so training on how to use AI is a skill that has applications beyond school.

6.4. Transparency & Explainability

To effectively manage and use AI, it needs to be transparent and explainable so that people can understand how it works, but a major limitation of AI is its lack of explainability. "They [AI] are often regarded as black boxes that merely attempt to map a relationship between output and input variables based on a data training set" (Chowdhury, 2012). This means AI can generate outputs such as the solution to a math problem or essay improvements, but the user may not know how the AI reached those conclusions. This can be troublesome because humans and AI have to work together. Users who use AI need the reasoning behind AI recommendations or else there will be a lack of trust and synergy. For example, if a student asked an AI to solve a problem but the AI is unable to explain how it solved it, the student wouldn't be able to learn the steps to reach the solution or trust it. Additionally, if the AI gave a wrong or problematic response, developers would be unable to easily fix it. For example, if the AI misunderstood the input or generated a bias, it would be difficult to figure out what caused them without explainability. To mitigate problems caused by lack of explainability, developers can use explainable AI methods like LIME or Anchors (Holzinger et al., 2022),

which help provide insight to AI logic. By adopting such techniques, AI systems can be more transparent, providing users insight into AI's decision-making process to foster collaboration between humans and AI.

6.5. Infrastructure and Cost

Since AI is a relatively new development, many school systems aren't ready to incorporate AI. There is a lack of ethical guidelines, technological resources, experience, and money to fully support the use of AI in education. To fix these problems, an organization or a branch of a school's executive system could be formed for managing AI to develop the proper infrastructure. This organization could determine ethical guidelines, purchase the software and hardware to use AI, and develop the training people will need to learn how to utilize AI. Basically, this organization would help make the addition of AI to education smooth, safe, and clear. Members would be people who are knowledgeable in the use of AI and management or can learn. Furthermore, partnerships could be created between schools, technology companies, and universities to promote the use of AI. Companies and universities could use schools to test or use AI while schools benefit off of experience and opportunities with AI. These partnerships allow students to be exposed to AI technology and allow the school to use AI at a lower cost, while universities or companies can benefit from recruiting future students and testing technologies.

Conclusion

In the context of AI's rapid development, it is crucial to examine the applications and regulations of AI in education. Though at the moment, AI has yet to become commonplace in the education sector, there is a possibility for AI to become a core component of education in the coming decades due to the rapid pace of its advancement. Correspondingly, we need to examine how AI can be safely and effectively implemented. AI applications in education can be grouped as "Student," "Guidance," and "Teacher" to clearly define their purposes. Grouping them in this way makes it easier to develop new applications for education because there is an organizational framework that helps developers understand this field. Principles from past approaches can be used to avoid reinventing the wheel and accelerate progress. Despite the potential of AI, there are constraints that need to be addressed such as ethics concerns, technical limitations, or cost. Through categorizing AI applications in education and understanding the drawbacks of AI, we can develop safe and effective AI-powered solutions to the education sector.

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Machine Learning Approaches to Analyzing Public Speaking and Vocal Delivery

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Abstract

The 21st century has ushered in a wave of technological advancements, notably in machine learning, with profound implications for the analysis of public speaking and vocal delivery. This literature review scrutinizes the deployment of machine learning techniques in the evaluation and enhancement of public speaking skills, a critical facet of effective communication across various professions and everyday contexts.

The exploration begins with an examination of machine learning models such as Support Vector Machines, Convolutional Neural Networks, and Long Short-Term Memory models. These models' application in the analysis of non-verbal speech features, emotion detection, and performance evaluation offers a promising avenue for objective, scalable, and efficient analysis, surpassing the limitations of traditional, often subjective, methods.

The discussion extends to the real-world application of these techniques, encompassing public speaking skill analysis, teacher vocal delivery evaluation, and the assessment of public speaking anxiety. Various machine learning frameworks are presented, emphasizing their effectiveness in generating large-scale, objective evaluation results.

However, the discourse acknowledges the challenges and limitations inherent to these technologies, including data privacy concerns, potential over-reliance on technology, and the necessity for diverse and extensive datasets. The potential drawbacks of these approaches are highlighted, underscoring the need for further research to address these issues.

Despite these challenges, the successes of numerous machine learning applications in this field are underscored, along with their potential for future advancements. By dissecting past successes and failures, the review aims to provide guidance for the more effective deployment of these technologies in the future, contributing to the ongoing efforts to revolutionize the analysis of public speaking and vocal delivery.

Keywords: Machine learning, Public speaking, Speech analysis, Vocal delivery, SVM, CNN, LSTM, PAAN

1. Introduction

Public speaking is a complex multidimensional art form that integrates verbal content, vocal delivery, and physical gestures to convey ideas. Mastery of public speaking has profound implications for effective communication and influence across diverse professional domains like business, politics, education as well as day-to-day interpersonal contexts. However, developing strong public speaking skills has historically been a difficult, subjective process relying on limited human feedback (Johnson, 2020).

The recent emergence of sophisticated machine learning techniques offers an exciting new avenue for analyzing and enhancing public speaking abilities objectively and at scale. This literature review comprehensively examines cutting-edge machine learning architectures that are being deployed to evaluate and improve vocal delivery - a critical dimension of impactful public speaking.

2. Applications of Machine Learning for Vocal Analysis

This section evaluates significant real-world applications where machine-learning techniques have been deployed for vocal delivery analysis and public speaking assessment.

2.1 Machine Learning Models for Vocal Analysis

A variety of machine learning model architectures have shown promising capabilities in extracting actionable insights from vocal delivery data. For example, Support Vector Machines (SVMs) can detect emotions, identify speakers, assess speech quality, and recognize anxiety based on vocal features like pitch, tone, pacing, and intensity (Lee et al., 2019).

Convolutional Neural Networks (CNNs) excel at classifying sentiments, non-verbal cues, and tonal patterns in speech data while also filtering noise and enhancing audio quality (Kim et al., 2021). Recurrent Neural Networks like Long Short-Term Memory models (LSTMs) can analyze topic flow, filler word usage, audience engagement patterns, and predict speech success over time by processing speech as temporal sequences (Williams et al., 2020).

More recently, Pre-trained Audio Neural Networks (PAANs) fine-tuned on large datasets have enabled very accurate accent, emotion, and tonal analysis by leveraging broad exposure to diverse speech data during initial training (Jackson et al., 2022). Overall, these ML architectures extract distinct vocal delivery insights difficult to discern through manual analysis alone.

2.2 Applications for Speech & Presentation Analysis

The world has already seen significant applications of vocal delivery analysis via ML. CNNs have been deployed to evaluate teacher clarity in vocal delivery and provide personalized improvement feedback (Liu et al., 2019). SVMs have assessed the speaking skills of business management students using vocal tone and modulation features (Patel et al., 2020). Eye-tracking studies have combined LSTM-processed vocal cues with visual gaze patterns to study social phobia and anxiety in public speaking contexts (Chollet et al., 2016).

Across these applications, machine learning has proven capable of delivering rapid, data-driven vocal analysis on a large scale that far surpasses the subjective, inconsistent feedback

generated through manual evaluation (Chen et al., 2015). The insights ML provides on vocal delivery can guide speakers to refine their tone, pacing, emphasis, and emotion - enhancing the clarity and impact of their communication.

3. Specific Machine Learning Techniques for Vocal Delivery Analysis

This section provides a more in-depth look at some of the specific machine-learning techniques that have shown promise for extracting insights from vocal delivery data.

3.1 Convolutional Neural Networks

Convolutional neural networks (CNNs) are well-suited for vocal analysis tasks because of their ability to automatically learn relevant speech features directly from raw audio data through successive convolutional and pooling layers (Sainath et al., 2015). For example, a 9-layer CNN architecture was utilized by Chollet et al. (2016) to extract vocal features related to speech anxiety from audio segments, achieving 86% accuracy in distinguishing anxious from calm speech. The convolutional layers autonomously learned to detect various vocal qualities like pitch variance, pacing, and trembling which were then classified into fully-connected layers. CNNs have also been implemented in vocal emotion classification, achieving 65-70% accuracy across multiple emotional states (Trigeorgis et al., 2016). Their noise robustness makes CNNs appropriate for real-world vocal analysis use cases.

3.2 Recurrent Neural Networks

Recurrent neural networks (RNNs) like LSTMs are advantageous for sequential vocal data as they maintain context through cyclic connections (Sak et al., 2014). RNNs can model time-based patterns in speech like changes in tone and pacing over a presentation. For example, Wörtwein et al. (2015) implemented a two-layer LSTM network combined with Support Vector Regression to track vocal feature changes over the course of 300 public speeches. This enabled the assessment of how pitch modulation, emphasis, and pausing evolved throughout each speech. The LSTM layers memorized preceding speech patterns which informed the analysis of subsequent segments. This temporal modeling captured individual speaking styles in a robust manner.

3.3 Transfer Learning

Pre-trained models like PAANs leverage transfer learning, where models initially developed for general speech tasks are fine-tuned on domain-specific vocal analysis datasets (Wang et al., 2022). For example, a PAAN first trained on over 60,000 hours of mixed audio data has been fine-tuned and achieved over 90% accuracy in classifying charismatic speaking styles within TED Talks (Zhao et al., 2022). The broad pre-training gave the model strong general speech feature extraction capabilities prior to specializing in the target vocal delivery analysis task. This transfer learning approach requires less training data than building customized models from scratch.

3.4 Data Collection

Effective applications of machine learning for vocal analysis rely on high-quality, representative training data. Some of the best practices for data collection include:

- Obtaining informed consent from speakers to use speech samples (Smith, 2021)

- Recording data from demographically diverse participants in varied settings (Park et al., 2020)
- Guiding speakers to provide a sufficient variety of speech styles, emotions, and vocal techniques (Yang et al., 2022)
- Supplementing audio with transcripts, surveys, and expert evaluations to enable richer training and evaluation (Wörtwein et al., 2015)

Careful attention to dataset diversity and quality is crucial for developing well-generalized machine-learning models that avoid bias. Ongoing research on mitigating bias and preserving privacy during speech data collection can further strengthen the viability of these techniques (Martin et al., 2022).

4. Discussion of Machine Learning for Vocal Analysis

This section discusses key considerations, challenges, and future directions for the use of machine learning in vocal delivery analysis.

4.1 Challenges & Limitations

ML-driven vocal analysis also poses challenges that must be addressed. Strict data privacy and consent requirements need to be followed when collecting speech data (Smith, 2021). Over-reliance on automation risks losing the nuance of human subjectivity (Wilson, 2019). Training datasets require diversity and breadth to avoid skewed model development (Park et al., 2020). Not all vocal qualities can be neatly quantified, and context inference remains difficult for ML techniques (Yang et al., 2022). While increasingly powerful, these technologies cannot wholly replace human guidance and rapport in public speaking education.

4.2 Future Outlook

Nonetheless, rapid advances continue in ML-enabled vocal analysis and real-world integration. With responsible data stewardship, tempered expectations, and hybrid human-ML feedback loops, these technologies hold immense potential for revolutionizing vocal delivery assessment and enhancement at scale (Mei et al., 2022). This emerging domain would benefit greatly from ongoing research addressing current limitations and biases through innovations in privacy-preserving ML, contextual reasoning, and inclusive data practices. In conclusion, machine learning shows immense promise in complementing human intelligence to unlock new possibilities for understanding and elevating the art of public speaking.

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To what extent were schools and stem education affected and rebuilt after the covid-19 pandemic?

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Abstract

The COVID-19 pandemic had a major impact on STEM education, affecting students, teachers, and the entire education system. The switch to online learning brought about many challenges, which have not been fully analyzed in current research. Reading and summarizing articles on this particular topic formed the primary methodology of this research paper. Upon examining sources on the topic, we found some of these challenges facing the transition to online learning include students' lack of motivation, the demoralization of teachers, and the change of priorities in STEM education. Moreover, STEM teachers' attitudes and views toward online teaching were negatively affected, leading to an increase in mental stress and a higher number of teachers quitting their jobs. On the other side, STEM professors who prioritized open communication and leniency in policies were more successful in creating a positive and inviting learning environment for their students. Based on this information, we can presume that the education system needs to be more adaptable and flexible to ensure that students and teachers receive the assistance they need in times of crisis. It is through their resilience and determination that STEM education will be able to continue to thrive in the post-Covid era.

Keywords: STEM, Covid, Resilience

Introduction

According to Daniel Kelly (2021), assistant professor of STEM Education in the Department of Curriculum and Instruction at the College of Education at Texas Tech University, the single most important event in recent history that had such a tremendous influence on education was Covid-19. The Covid-19 epidemic began in late 2019 but did not have a true impact until March 2020, when on-site schools were completely closed following spring break. The transition to online learning persisted for the remainder of that academic year. The majority of schools made the decision to continue offering lessons online that following August using tools like Zoom, Schoology, Canvas, and Google Classroom. Again, throughout the duration of that academic year, strict protocol stayed in place. Even after the Covid vaccination was discovered and distributed, there were still stringent regulations in place to protect students. Many schools around the country mandated the usage of masks for the school year 2021–2022, and they set up hand-free hand sanitizing stations for students to utilize. This was the year that schools and students' lives began to be rebuilt and reimplemented in terms of education, particularly STEM education. In this period of reconstruction, there are many diverse viewpoints to take into account, ranging from students, teachers, school boards, and the federal Department of Education. Overall, an evaluation of the situation shows that STEM teachers were discouraged from teaching, priorities for STEM education were changed, school boards implemented multiple techniques to help cushion the blow from Covid, and increasing students' on-campus, peer, and familial support helps reintegrate them into STEM education.

Effects of the Pandemic on Teaching Staff

While the pandemic had a major negative effect on students, some of this effect could be attributed to students' lack of motivation to participate in school. This lack of motivation to do work, however, could not explain the negative effect Covid had on teachers. According to Daniel Kelly (2021), "teachers are working longer hours, yet instruction is suffering due to virtual/hybrid teaching, social distancing, and sanitation concerns." Kelly illustrates how even though teachers were putting in more effort than a normal school year, they were still showing worse results, which means that teachers did not have a lack of a work ethic during Covid, but a surplus of it, and it still wasn't enough to overcome the difficulties of online teaching.

Even though instructors put forth more effort, their working circumstances and altered lesson plans led to their demoralization (Kelly, 2021). The goals of general STEM education have allegedly shifted, according to Jessica Sain and Bradley Bowen (2022), who are affiliated with Oklahoma State University and Virginia Tech, respectively. The student's lack of engagement and the shift in priorities made it difficult for instructors to perform their tasks, which increased mental strain and led to an increase in the number of teachers quitting their jobs in an effort to alleviate that mental stress.

Another negative outcome that resulted from the pandemic was the teacher's outlook on online learning becoming very negative. According to Ishe DeCoito and Mohammed Estiathiye (2022), Ishe being part of the Faculty of Education at Western University, "despite few successes, teachers faced a wide array of challenges that negatively affected their attitudes and views toward online teaching." Given the evidence, which was specialized to STEM teachers, we can assume that STEM teachers did not find online school beneficial, and

instead found in harmful to the general learning environment. While the overall self-efficacy and technological competency slightly increased their view of online learning (DeCoito & Estiathiye, 2022), the effect was not enough to completely alter the previously mentioned negative effects of online school.

The final point to touch on is the adaptability of STEM teachers to the abrupt conditions presented due to Covid-19. According to Mina Sedaghatjou et al (2021), a graduate of the College of Liberal Arts and Science at Alfred University, “the effective domain of teaching is identified as the missing dimension of an e-learning framework.” Based on the given information, we can infer that the domain of online school, which is the platform used to teach online, is the missing portion to have a properly functioning online educational facility. However, this domain has a very minimal impact on STEM, and is the “area of least concern for teaching STEM online.” (Sedaghatjou et al, 2021).

In conclusion, due to students' and teachers' lack of motivation, extra hours worked, STEM education's changing priorities, the number of challenges to online school, and the domain used for online school, STEM teachers were discouraged from teaching in general, and the STEM curriculum took a hit because of the inability for it to be taught.

College Stem Adjustments Post-Covid

STEM education does not only mean grade school, it also applies to any college or university STEM classes, majors, or pathways. Covid also didn't only affect grade school, its effects were felt through all facets of education, including higher education like colleges and universities. Effects like the switch to online education and the personal relationship disconnection between teacher-students occurred throughout universities.

However, some STEM professors attempted to rebuild that personal connection with their students and have a positive learning environment. According to Sherry Pagoto et al (2021), a member of the Department of Allied Health Sciences at the University of Connecticut, the most common behaviors professors did to make their students comfortable and cared for was leniency on the professors' policies and an open, quick line of communication. Meanwhile, the most common behavior that made STEM undergraduates feel uncared for was a very closed and poor line of communication (Sherry Pagoto et al, 2021). In other words, employing practices that normally would be common in non-Covid times, like an open line of communication through things like office hours and tutoring, allows for a more positive school experience for STEM undergraduates. Not only professors, but the university itself can implement ideas to make students feel more accepted and content with their academic situation. The most beneficial implementation would be to make inflexible policies and rules a lot more lenient (Sherry Pagoto et al, 2021). This implementation, along with the professor's individual contributions would give undergrad STEM students a more comfortable, and therefore more productive work environment.

Another factor that would allow college students to have a more comfortable and accepting environment would be family and peer support. According to Sivan George-Levi et al (2022), who is part of the School of Behavioral Sciences in Peres Academic Center, “hope and support from peers mediated the relations between perceived family support and perceived on-campus support”. Basically, peer support is necessary in order to not be overwhelmed with

either family or on-campus support. Without family support, peer support has nothing to mediate, and without on-campus support, Stem students would lose out on possible academic opportunities and academic successes. Since these three need to be constantly working together, each is a vital part of rebuilding the familiar and beneficial college ecosystem post-Covid.

Overall, Stem college students need support and leniency from multiple different groups, including but not limited to professors, universities, families, and peers. With the combined support from each of these groups, along with the support mediating and keeping each other in balance, a Stem undergraduate student would be able to re-enter the intimate and constructive ideal college environment after the Covid era.

School Boards Reactions and Adaptations

School boards across the country have had to quickly adapt and make difficult decisions in response to the COVID-19 pandemic. One major challenge has been maintaining and restoring access to STEM education, which is essential for the development of a strong workforce and for preparing students for future careers in science, technology, engineering, and math.

In order to keep students engaged in STEM education during the pandemic, many school boards have turned to online and distance learning platforms. This has allowed students to continue learning and participating in STEM classes, even when in-person instruction is not possible. Additionally, many school boards have also made an effort to provide students with access to technology and resources they need to participate in online learning, such as laptops and internet access.

Another way that school boards have adapted to the pandemic is by working closely with STEM educators to develop new and innovative teaching methods. These methods often incorporate technology and online tools to make learning more interactive and engaging for students. School boards have also been working to increase the number of STEM programs and resources available to students, such as coding classes, robotics clubs, and online STEM competitions.

Despite the challenges posed by the pandemic, school boards have been working hard to ensure that students continue to have access to high-quality STEM education. By utilizing online learning platforms, providing students with the necessary technology and resources, and working closely with STEM educators, school boards are helping to keep students engaged and motivated in STEM subjects, and preparing them for future success in these fields.

Conclusions

The Covid-19 pandemic had a major impact on STEM education, affecting students, teachers, and the entire education system as a whole. The switch to online learning brought about many challenges, including students' lack of motivation, the demoralization of teachers, and the change of priorities in STEM education. STEM teachers were burdened with extra work hours, but their efforts did not translate into better results due to the difficulties of completely

virtual and hybrid teaching, social distancing, and sanitation concerns. Moreover, STEM teachers' attitudes and views toward online teaching were negatively affected, leading to an increase in mental stress and a higher number of teachers quitting their jobs. The domain used for online teaching was identified as the missing dimension of an e-learning framework for effective teaching, but this area of least concern for teaching STEM online.

In post-Covid era, STEM education at the college level faced the similar challenges as primary and secondary school. These challenges include the switch to online education and the disconnection between teachers and students, however, STEM professors who prioritized open communication and leniency in policies were more successful in creating a positive and inviting learning environment for their students. The use of online resources such as office hours and tutoring services also aided to bridge the gap between students and teachers.

The pandemic wasn't the tragedy to education that it could have been. It has shown that the education system needs to be more adaptable and flexible to ensure that students and teachers receive the assistance they need in times of crisis. STEM education, in particular, needs to be reevaluated to address the challenges and changes brought about by the pandemic and to provide a more effective learning experience for students. The efforts of teachers and educators to adapt and overcome these challenges is a start, and it is through their resilience and determination that STEM education will continue to thrive in the post-Covid era.

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Artificial Intelligence: A Tool to Track Student's Engagement and Understanding to Enhance Teaching and Learning

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Abstract

In this research paper we delve into the use of intelligence (AI) as a tool, for monitoring student engagement and comprehension in educational settings. With the evolving world of technology and education AI has emerged as a game changer in enhancing teaching and learning outcomes. We explore AI based approaches such as natural language processing, machine learning and data analytics that have been employed to track student engagement and understanding. Additionally we examine the advantages and challenges of integrating AI in education. Ethical considerations surrounding AI implementation in contexts are also addressed, along, with an analysis of case studies showcasing the practical implications of AI driven educational initiatives. Ultimately our goal is to shed light on how AI can be utilized to create personalized and effective learning environments that benefit both students and educators

Keywords: Artificial intelligence, Natural language processing, Machine learning, Adaptive learning systems, Personalization of learning, Accountability, Liability

1. Introduction

Artificial intelligence (AI) has had an impact, on industries, including education. AI technology presents prospects for transforming teaching and learning by offering tools to monitor student involvement and comprehension. This paper delves into the potential of AI in augmenting education through the surveillance and enhancement of student engagement and understanding. In this opening section we provide an outline of the significance of student involvement and comprehension, in education while also introducing AI concepts within an educational context.

2. Literature Review

Background

Essential aspects of efficient education include understanding and participation. When course material is well-understood due to active engagement, scholarly achievement is likelier (Fredricks, Blumenfeld, & Paris, 2004). Notwithstanding efforts by instructors, measuring and maintaining enthusiastic participation and understanding remains a distant goal. Conventional evaluation techniques like exams and quizzes fail to provide a comprehensive picture of students' involvement and learning depth.

Within the field of computer science, there lies a subset dedicated to replicating cognitive functions through artificial means—AI—which is revolutionizing educational possibilities. Educators can develop more personalized teachings by gleaning comprehensive understanding of students' conduct, tastes, and learning habits via AI technology integration (Siemens & Gasevic, 2012). AI analysis of student-digital interaction data produces instantaneous feedback for all parties involved (students & teachers).

Objectives

The primary objectives of this research paper are as follows:

1. Conduct thorough research on the numerous ways Artificial Intelligence facilitates accurate recording of students' attention levels throughout classes.
2. Probe the advantages and drawbacks of coupling artificial intelligence with learning environments.
3. Examining legality ramifications while debating artificial intelligence introduction inside classroom environs.
4. Articulating the tangible consequences of introducing AI into educational settings.
5. Providing predictions on how AI will shape educational landscapes in years to come.

Leveraging AI Techniques for Students' Engagement Monitoring and Knowledge Assessment

This section discusses the AI-based approaches and technologies that have been employed to monitor student engagement and comprehension. It covers areas such as natural language processing (NLP), machine learning (ML), data analytics, and adaptive learning systems.

Natural Language Processing (NLP)

NLP is a subfield of AI that focuses on the interaction between computers and human language. In education, NLP techniques are used to analyze textual data, such as students' written responses, essays, and forum posts. By applying NLP algorithms, educators can gain valuable insights into students' language proficiency, critical thinking skills, and comprehension of course material.

Machine Learning (ML)

Through examining Data sets, ML algorithms locate patterns after which they predict impending circumstances. Within education's purview, ML models can learn from diverse data points—student evaluations, conduct metrics, and academic achievements included. Models generated from data analysis enable accurate forecasts of student achievement while identifying struggling learners and tailored educational roadmaps.

Data Analytics

Analyzing student data is crucial in education; this includes evaluating academic performance, attendance records, and learning outcomes. In possession of powerful abilities to decipher vast amounts of information, these advanced analytics tools pinpoint intricate configurations of statistics. Using these insights strategically enables educators to optimize their tactics, boosting both teaching quality and pupil progress.

Adaptive Learning Systems

Personalized educational experiences tailored to each learner's needs and abilities are delivered through adaptive learning systems guided by artificial intelligence. Employing cutting edge algorithms, these systems evaluate and change according to each pupils necessities to provide unique instructional encounters. tracking students' progress allows adaptive learning approaches to tailor education to each individual.

By granting access to tailor-made instruction dependent on students' performance levels and linguistic variations educators may concentrate more intently using technologically advanced pedagogies; this could lead higher grades opportunities throughout several academic years or subjects offered across broad geographic boundaries encompassed within one virtual space with smart applications always ready tackle daily challenges encountered during scholarly endeavors focusing improved user interface experience plus convenience offered digital note-taking app used offline integrate seamlessly with cloud computing platform when connectivity permits; organic chemistry texts integrate spectroscopy animations plus reactions pathways whenever possible avoiding confusion might arise naturally through exploring several textbooks plus rewritten works & proposals constructed especially per request topic about which authorities were consult first begin construct clear if interesting leads existed somewhere else before summarising presented material under open source management systems facilitates easier replication attempts under transparent reference conditions allowing main contributors add reference materials timeliness along each step being accounted through each version issued furthermore student journals encourage articles documentation seminars better cooperation between individual minds whenever trying unravel complex problems specific courses involving parallel research projects become much discussed concerning individual cases whenever preferred avoid

We discuss how AI integration enhances monitoring of students' attention and knowledge acquisition in educational contexts.

Personalization of Learning

By assessing pupils' unique talents and necessities, academics can design tailored instructional opportunities thanks to AI technology. By tailoring educational materials to each student's needs, increased involvement results from suitably challenging learning experiences, thereby driving comprehension gains.

Early Intervention

Identification of possible struggles or disconnection during the initial learning stages is a capability of artificial intelligence (AI). By intervening swiftly, educators can furnish beset pupils with extra aid and assets to get back on course and accomplish academic triumph.

Enhanced Feedback

Automated intelligence promptly suggests actions students must take to enhance identified deficiencies via rapid feedback. Feedback given promptly encourages a more profound grasp of challenging concepts.

Efficient Resource Allocation

Information gathered offers valuable assistance to educational institutes improving resource utilization. By allocating teaching staff, resources, and technology effectively, we aim to enhance student performance.

Continuous Improvement

By leveraging AI, educational establishments may collect insights from educators and learners alike, advancing manuals and pedagogical strategies continuously. Tailored learning pathways are introduced through an iterative educational process, fostering adaptive relevance.

Hurdles Concerning Application of Artificial Intelligence inside Classrooms

Notwithstanding AI benefits in ed with numerous drawbacks present.

Privacy Concerns

Data collection and examination concerning students give cause for concern regarding privacy and safety. Ensuring privacy is crucial; therefore, institutions need effective data safety procedures and unwavering clarity regarding how they handle data.

Equity and Access

Unequal availability of technological resources alongside regular internet available pose difficulties. Unequal access to quality learning materials because of differences in technology understanding could widen rather than narrow gaps between communities.

Teacher Training

Teachers need adequate training so they may competently incorporate AI technologies into their lessons. Developing proficiency requires built-in learning opportunities; otherwise, the consequences could be disastrous.

Ethical Considerations

Designing AI technologies entails incorporating moral guidelines like equity, clarity, and liability. To avoid inherent biases, active measures against AI algorithmic fairness issues need to be undertaken by us all.

Examining ethical dilemmas inherent in AI-assisted learning platforms

Examining the intersections between education and AI, we find ourselves compelled by the urgency of practicing ethically informed AI integration.

Fairness and Bias

Artificial intelligence algorithms sometimes unknowingly emulate biases discovered in earlier info. Fairness depends on evaluating and counterbalancing prejudices present in AI frameworks.

Transparency

Artificial intelligence receives attention; thus, educational institutions must elucidate information regarding processing methods involving students' data. Protection of student rights requires defined guidelines and processes.

Data Privacy

Privacy and compliance are paramount when dealing with student data; thus, diligently follow guidelines and rules. Data protection necessitates that educational establishments prioritize informed agreement providing proper authorization from stakeholders .

Accountability

It is essential to define clearly how responsibilities will be assigned to tackle any consequences of AI misbehavior. Students and parents should

Avail yourself of alternatives for expressing worries and pursuing redressal measures.

Case Studies: Transformative Potential of Artificial Intelligence in Learning Environments

Offering concrete instances of instilled AI-driven solutions enhancing the learning environment, the upcoming segment drives home the transformative potential of technology integration into educational systems.

Case Study 1: Khan Academy

Leveraging AI capacities, Khan Academy designs comprehensive learning routes specific to every learner. Analyzing user information, the platform suggests tailored courses and workouts to elevate interest and insight.

Case Study 2: Georgia State University

To identify struggling student early on, Georgia state university put into place an AI-powered counseling program. Employing this method yielded impressive results on boosting student dedication and grades excellence.

Case Study 3: Duolingo

Harnessing artificial intelligence enables customized lesson plans based on each learner's achievements. Personalization intensifies immersion, accelerating proficiency attainment amidst optimized learning conditions.

Assessing AI's Long-Term Effect On Educational Institutions & Curricula

Herein, we explore the prospects for Future AI Education Integrations

Enhanced Virtual Learning Environments

Innovations in artificial intelligence allow virtual learning spaces to aspire towards higher levels of realism and customization for learners.

AI-Enhanced Assessments

Tools powered by Artificial Intelligence (AI) constantly advance and improve student evaluation accuracy and scope.

Global Accessibility

Prioritizing universal access, future educational systems shall cater to all schools regardless of resources or location.

Continued Ethical Considerations

Indeed, moral implications prevail here: continuous dialogues shall govern educational AI's judicious employment.

3. Conclusion

By monitoring student involvement and comprehension to improve teaching and learning, artificial intelligence has the potential to revolutionize education. Artificial intelligence (AI) delivers individualized, data-driven solutions that can enhance educational outcomes through NLP, ML, data analytics, and adaptive learning systems. However, there are obstacles to implementing AI in education, such as privacy difficulties, equality problems, and ethical issues that need to be properly addressed. Institutions can improve the learning environments for students and eventually prepare them for success in the digital age by carefully integrating AI into educational settings.

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How generative AI affected Software Engineering

Enver Nuri Ünal

Abstract

Generative Artificial Intelligence influenced the field of software engineering in recent years. This abstract provides an overview of the ways in which generative AI has affected software engineering, highlighting key advancements, challenges, and potential future directions.

Generative AI assists developers with code generation, code quality, real-time suggestions. It also aids in software testing by generating test cases, identifying edge cases, and automating bug detection and fixes. Thus, usage of Generative AI enables more robust software development. However, the adoption of generative AI in software engineering is not without challenges. The ethical issues, bias in generated code, security and correctness of AI-generated code are some of the many areas of concern. Looking ahead, the ongoing development of generative AI will likely lead to more efficient and collaborative software engineering practices.

In conclusion, generative AI has a profound impact on software engineering. It helps with the software development lifecycle in many ways. While challenges remain, the future promises further innovation and closer integration of generative AI into the software development lifecycle.

Keywords: Generative Artificial Intelligence, software engineering, potential future directions

Generation of Automatic Data-Driven Feedback to Students Using Explainable Machine Learning

Bentley Gift

Roy Kamau Mbui

Angelo Okari Morara

Abstract

This paper proposes a novel approach that makes use of learning analytics techniques and explainable machine learning to provide automatic and intelligent data-driven feedback that supports students' self-regulation of learning analytics. Prior studies within the field of learning analytics predict students' performance and use the prediction status without explaining the reasons behind it. Our proposed method has been developed based on learning management system (LMS) data from a university course. It extends this approach by explaining the reasons for the predictions and automatically provides data-driven recommendations for the action. The effectiveness of the predictive model of the proposed approach is evaluated, with the results demonstrating 90 per cent accuracy.

Keywords: Learning analytics, Explainable machine learning, Feedback provision, Recommendations generation, Dashboard

Health problems among radiographers: An empirical study in private hospitals

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Abstract

This survey based descriptive research work has been undertaken in Tirunelveli city, Tamil Nadu with the objective of examining various health problems of radiographers working in private multi-speciality hospitals. In order to know the health-related problems, the present study has examined nine variables related to both physical and mental health. The study has sampled 60 radiographers using both convenience and judgement sampling techniques. Primary data for the study have been collected using questionnaire method. Secondary data have been collected from books, journals and websites. Percentage, Mean and Standard Deviation have been administered to understand perception of radiographers towards various health related problems. The result of the study has discovered that tiredness and low energy; body pain; difficulties in sleeping; depression, anger, and emotional disturbances; and digestive disorders are the foremost health related problems. Skin and eye problems; urinary tract infection; diabetes mellitus and hypertension; and irregular menstrual, weight loss and hair loss are the next foremost health related problems of radiographers. The perception of the respondents towards the discussed variables is moderate. The study has given suitable suggestions to improve health of radiographers working in private multi-speciality hospitals.

Keywords: Radiographer, health, multi-speciality hospital, Tirunelveli city

The integration of Artificial Intelligence (AI) in healthcare

Josh Chandra
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Abdoul Mbaye

Abstract

The integration of Artificial Intelligence (AI) in healthcare brings up significant legal and ethical concerns that require attention. These challenges involve safeguarding patient privacy, avoiding discrimination and surveillance, and ensuring that technology does not replace human judgment. Additionally, there is a real threat of data breaches and inaccuracies that can have severe consequences for patients, particularly in critical situations. However, we must prioritize transparent algorithms, privacy protection, and patient welfare. To mitigate potential risks, it is crucial to establish strong cybersecurity measures. Despite the absence of established protocols, we should remain confident in our ability to address these concerns and ensure the responsible and safe use of AI in healthcare. Furthermore, there is the economic value that must be evaluated when implementing AIED systems in real-world scenarios. The obstacles that come with authorizations and AIED system accuracy could drive an increase in healthcare costs. Developing, implementing, and maintaining software will concur with an upfront investment, and should be compared to the long-term effects of AI utilization. However, if used effectively and in a streamlined manner, AI in healthcare has the possibility of increasing diagnostic performance, thereby improving the allocation of resources and funds to reduce the cost of treatment. Artificial intelligence in healthcare has many significant aspects and impacts in regard to science. Artificial intelligence has been improving and adapting in recent years and this has brought up many questions as regards how smart and advanced it can become as well as what it is capable of. Some scientific obstacles that might come with the integration of Artificial Intelligence in healthcare might include finding and manufacturing suitable equipment that is safe and accessible, determining how advanced the AI should be, and whether or not to allow the artificial intelligence access to new medicines and procedures that are more recent and/or dangerous. However, if the necessary precautions are taken and decisions are made in an orderly fashion, Artificial intelligence can make a lasting impact on human healthcare.

Keywords: Artificial Intelligence, healthcare, legal and ethical concerns

Analysis of Intrinsic Motivation Influence on Employee Affective Commitment During Digital Change

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Abstract

Technological, economic and other innovation-related advances of the 21st century have influenced the old, traditional business models. Presently, organizational change has become an integral part of corporate strategy for the majority of businesses. Such shifts have resulted in both new challenges and opportunities. The expansion of the use of information and communication technologies has driven fundamental shifts towards digital change. Organizations are being forced to revise processes, goals and overall mission in order to stay competitive in the marketplace. However, the implementation of digital transformation brings uncertainty, causes stress and raises concerns about future jobs. The study employs a literature review to fill the gap in understanding the relationship between employee intrinsic motivation and affective commitment during the transformation. A conceptual model proposes the antecedents of employee motivation (Organizational Citizenship Behavior and Leader Member Exchange) and investigates its impact on employee commitment to change. The utilized model elucidates how to maintain employee intrinsic motivation and affective commitment in the context of organizational transformation and sets the ground for future research.

Keywords: Affective Commitment, Digital Change, Intrinsic Motivation, Leader Member Exchange, Organizational Citizenship Behavior

1. Introduction

During the last two decades the business landscape has expeditiously transmuted. Rapid advancements in technological innovations, globalization, pandemics and other socio-political factors influenced the way organizations work. The increased usage of information and communication technologies has made fundamental shifts in organizational practices (Augustsson et al, 2017). Accordingly, traditional business models have become inefficient for meeting new challenges. In order to keep pace with changes and remain competitive, organizations follow modifications and adjust internal processes, values and employee mindset in accordance with new norms and requirements (Johansson et al, 2019). These types of changes have developed into an inevitable subject of interest for scientists and businesses struggling with different disruptions.

The effects of digital change on business development have become an important issue for various studies and managerial decisions in previous years (Seppälä et al, 2012). Scholars are exploring the potential impacts of change on different levels of organization, and businesses are analyzing the results of other previously integrated digitization processes to adjust their next steps and strategies accordingly. Fitzgerald et al (2013) defined digital transformation as “the process of using digital technologies to create new – or modify existing- business processes, culture, and customer experiences to meet changing business and market requirements” (p.16). In early times such processes only concerned IT department workers, those who were software and hardware related employees, but nowadays digital change influences all business functions and is embedded into daily routines of organizations (Westerman, 2014; Verhoef, 2019). For this reason, an adoption of digital change grew into a strong differentiator between the most successful enterprises and the rest.

Nevertheless, the implementation of technological transformation is a challenging mission. Over 60 per cent of enterprises failed to achieve organizational change due to improper integration (Woywode, 2008; Sellnow, 2005). The openness of employees to change plays an important role in the process of change, as it affects the attitudes and behaviors of all persons at the individual, team and strategic levels. This type of transformation introduces new jobs, practices, causes stress and raises concerns about employee performance. An efficacious transformational plan requires low resistance and full participation of all middle level managers and other employees. Past research has identified that successful organizational change is achieved through effective leadership and positive employee commitment (ibid.).

2. Previous Research

2.1. Review Research

Although the concept of digital change is new to academic research, a significant amount of studies has been conducted to explain the emergency and future trend. An early article on digital transformation, by Cartwright et al., (2003), discusses the impact of new information technologies on business strategy. The authors described the drivers of new information technologies that change the traditional processes of the value chain. Furthermore, a number of other research investigated the effect of digital transformation on individual, collective and corporate levels of an organization. Taking a central approach from an employee perspective, McAfee (2014); Autor & Acemoglu (2011) examined the impact of digital technology on job requirements and employee responses to technological change. These studies focused on the

need for employee development and organizational resilience to various types of changes. Moreover, Davis (1989) and Orlikowski (1992) looked for the influence of technology on workplaces. Along with all, Cashman (1976), Lazarus (1984), Evans (1986), Burns & Bass (1988), Avolio (1990), Barbuto (1990) and Tellegen (1999) have applied different theories such as job characteristics, expectancy and LMX (leader member exchange) theories to predict the relationship between employee motivation and organizational commitment.

Employee motivation and commitment are the main factors influencing the success of any organization (Meyer et al., 2007; Rahim et al., 2018; Nizam, 2015; Aziz Jalloh et al., 2016; Pancasila et al., 2020). Significant number of studies have been conducted to identify the causes that impact motivation and investigate the link between individual motivation and commitment. Bytyqi (2020) analyzed the relationship and showed that motivation at the workplace has a positive influence on employee commitment. The regression analysis illustrated motivation having a 36 per cent effect on commitment among employees.

Leadership is an important driver of organizational change and a key indicator of strong transformation along with communication and corporate culture (Gill, 2002). Among all other leadership styles, transformational leadership is best suited for complex innovations. A transformational leader prepares followers for change, communicates the vision, encourages and motivates them towards the accomplishments (Sellnow, 2005). This type of leader listens to followers, supports with help and provides a smooth shift for a new stage. Positive relationships create a huge value and competitiveness for an organization. Stewart (2007) defined the Leader Member Exchange (LMX) as “emotional support and exchange of valued resources between the leader and members” (p.532). Besides leadership, another influential factor of successful change is motivation and commitment of individuals (Beck, 2008; Choi, 2011). Positive employee reactions reduce stress and resistance to change, influencing organizational performance.

2.3. Research Objectives

The current research objective is to suggest a model which identifies antecedents of employee intrinsic motivation (e.g., organizational citizenship behavior, leader member exchange) and together with change management and leader member exchange (in the future LMX) theories to analyze its influence on employee change commitment. The paper aims to establish the relationship between intrinsic motivation and affective commitment. The following research questions will be considered and explored during the course of the study to ensure a full understanding of the potential relationship between variables.

The main focus of the present research is on how employee affective commitment is influenced by intrinsic motivation during digital change. Consequently, sub questions are analyzing the effects of antecedents: OCB and LMX on employee intrinsic motivation. Based on this, the present research hypothesizes that employee intrinsic motivation has a significant impact on organizational change commitment; antecedents have a positive relationship with intrinsic motivation to deal with different types of challenges during the technological disruptions and transformation.

3. Literature Review

3.1. Organizational Change- Digital Transformation

Fast-expanding disruptions of the 21st century have shifted the competitive positioning of organizations within the market (Handfield, 2017; Oke, 2019). Factors such as technological innovation, financial crises and global pandemics have resulted in both new challenges and opportunities for businesses. All these changes bring unpredictability within the organizations and drive them to adjust the organizational policies, procedures, values and mindsets of employees (Seeger, 2005; Johansson, 2008). During such disruptions, effective change management is fundamental in handling modifications and maintaining competitive market position. Murthy (2007) defined Change Management as “managing the process of implementing major changes in information technology, business processes, organizational structures and job assignments to reduce the risks and costs of change and optimize its benefits” (p.22). Therefore, efficacious organizational change needs effective leadership, transparent communication, employee “openness to change”, and trust between leader and follower.

Organizational change has been examined on both micro and macro levels. Macro level refers to shifts within the physical working environments, including in leadership and in corporate culture of organizations (Brown 1997; Judge et al, 1999; Fugate, 2011). Micro level alterations are attributed to individual level, such as the worker’s ability to deal with the potential change, this can be influenced by persons’ personality traits, perceptions and commitment (Alfes et al, 2019; Neves, 2018; Wanberg, 2000; Judge, 1999). Human Resource Management plays a pivotal role on both levels as if utilized it can become the driving force of transformation (Anderson, 2010). Bringing employees on individual, group and managerial levels on cooperative terms with the processes of change. According to Beck (2008) and Choi (2011) employee perceptions and their positive reactions are important factors in achieving the desired outcomes, thus, employee intrinsic motivation and their affective commitment are the cornerstones for influential change management.

3.2. Employee Commitment

Research on employee commitment during organizational change has been of interest to scholars and practitioners for the past four decades (Mathieu, 1990; Meyer, 1991). Commitment is associated with a sense of enthusiasm that drives employees to high performance and better results. Allen (1996) defined employee commitment “as a psychological link between employee and his or her organization that makes it less likely that individuals will voluntarily leave the organization” (p.252). Employee commitment consists of three components: affective, normative, and continuance (Allen & Meyer, 1990; Mathieu & Zajac, 1990).

Affective commitment (AC) refers to the desire to stay within an organization by demonstrating cooperation and loyalty (Allen & Meyer, 1990). Meyer, Stanley, Herscovitch & Topolnysky (2002) defined normative commitment (NC) as a feeling of responsibility to remain with an organization. The continuance commitment (CC) is related to an understanding of employees about the existence of certain financial risks if they switch to

another place (Natali, 1990; Mathieu, 1990). The affective commitment will have a positive impact on the change processes, while continuance commitment will influence organizational performance negatively (Herscovitch, 2002; Gellatly, Meyer, Luchak, 2006).

The literature exploring the commitment to organizational change states that work experience, job satisfaction, motivation, as well as team level social-bonds are important contributors to commitment (Sinclair et al, 2005; Meyer & Allen, 1991). Employees with clear responsibility, freedom of action, harmony in the team and the support of the leader feel job satisfaction and, therefore, are fully committed to their work. Shared values, beliefs, and corporate culture also play an important role in people's positive commitment (Schein, 1996; Kotter, 2008).

Employee commitment during organizational change is central. Recent advances in smart technology have changed job characteristics and heightened employee fears about future jobs and occupations (Vukšić, 2018; Westerman, 2014). According to Shin et al (2015), How leaders deliver information motivates their followers, prepares them for change, influences their commitment to change. Positive attitudes towards change during the initialization phase are to remain consistent (Meyer, Topolnysky, 2010; Cady, 2001, Seo, 2012). In the context of organizational change, dedicated employees with affective commitment support change, put in more effort, and participate in the implementation of the plan (ibid.). Therefore, the current study aims to explore the factors that generate employee intrinsic motivation resulting in positive affective commitment.

3.3. Employee Intrinsic Motivation

Motivation within the organizational context has been studied as a component to organizational change, job performance, commitment and overall organizational wellbeing. Motivation is affected by internal and external factors, which tend to change based on individual and environmental differences. Significant amount of research has been conducted to interrelate motivation with the results of individual and organizational performance during the change (Kanfer, 2017; Herzberg, 2017). Specifically, the literature illustrates the existence of studies investigating the relationship between employee motivation with job satisfaction, task performance, employee commitment, work-family conflict and stress (Wigfield, 2006; Atkinson, 1964). Galetta (2013) defined motivation as internal energy and willingness to drive things forward to achieve the expected outcome. Therefore, highly motivated employees are target oriented, productive and committed individuals.

Psychological and business literature suggests that there are two types of employee motivation based on individual expectations related to achievement, reward systems, and task execution: extrinsic and intrinsic (McClelland, 1985; Maslow, 1987). Intrinsic motivation comes from a person's inner desire to work and create something for the organization. Internal promotions, new responsibilities, flexible working hours, emotional connections, and a degree of autonomy are examples of intrinsic motivation. On the contrary, people are motivated to receive external incentives such as awards, prizes and bonuses (Ushioda, 2013; Locke, 1991; Elliot, 2005). Although these two factors can motivate employees, they can have different effects on personal opinion about tasks and the level of their performance (Jungert, 2018).

Due to the differences between intrinsic (self-motivation) and extrinsic (external regulations) elements, in order to explore what type of motivation is either displayed or required at any specific time period, Self-Determination Theory (SDT) could be employed. By considering

the driving factor for individuals in the context of transformational change, SDT provides another perspective to motivation (Deci and Ryan, 2000). Deci and Ryan, (1985) first introduced SDT to define and differentiate the main motives (e.g. competence, autonomy and relatedness), that influence human behavior at a workplace. According to the authors, SDT supports the notion “work environment entails conditions that direct and energize employee behavior. It focuses on indicating the motives and conditions encouraging individuals to behave in a certain way within organization” (Deci and Ryan, 2000, p.68; 2012, p.416). This includes the psychological needs of the employees such as need for relatedness, need for autonomy, need for competence that are the constituents of self-motivation during the transformational change.

Employee motivation is not a constant phenomenon and is responsive to internal and external factors (Herzberg, 2017; Amabile, 1993). Technological disruptions, organizational restructuring, work characteristics, job security, new process requirements affect people’s motivation. Digital transformation replaces old procedures, introduces new technology-driven practices, and influences employee behavior. The key to successful change is recognizing individual responses and motivating them throughout the implementation process (Herzberg, 2017). Taking into account that digital transformation is accomplished effectively when employees are internally motivated and satisfied with the process and the benefits obtained at the end (ibid.). The current research paper attempts to investigate the effects of intrinsic motivation on affective commitment of employees.

Intrinsically motivated employees are committed to goals and achieve better organizational outcomes. Recent studies have attempted to establish a relationship between motivation and job performance. To predict the positive or negative state of employee motivation, many authors have identified antecedents (Woo, 2013; Miller, 1992; Perry, 2008). They argued that organizational citizenship behavior (OCB) and LMX directly affect workplace motivation.

3.4. Organizational Citizenship Behavior

OCB is one of the most extensively researched issues in organizational behavior during the last recent years (Podsakoff et al., 1993; Emmerik et al., 2005; Zeuars et al., 2000; Lievens and Anseel, 2004). Organizational Citizenship Behavior (OCB) describes all types of positive and supportive employee attitudes that are not part of their official responsibilities, as a matter of someone’s own choice. Behavior is done voluntarily to help and assist individuals, co-workers, team members and enterprise as a whole (Organ, 1993, 1988; Podsakoff, McKenzie, 1997). These types of efforts are not rewarded, but increase effectiveness of the organization. Organ (1988) classified OCB into 5 categories (five dimensions’ framework): altruism, courtesy, sportsmanship, conscientiousness and civic virtue.

OCB reduces stress, creates a supportive environment, improves interactions among co-workers, motivates people and influences their job performance. Previous literature illustrates the positive relationship between OCB and employee outcomes (Smith, 1983; Graham, 1991; Morrison, 1994; Dyne, 1994). Binnewiess et al (2009) discussed the positive impact of individual drive and willingness to help others (OCB) on the performance of common tasks. In addition, Karambayya (1989), Podsakoff & McKenzie (1994) searched for the main influences of OCB on teamwork and organizational unit levels. The authors found the positive relationship between all five OCB elements, employee and organizational performance.

Digital transformation brings uncertainty, ambiguity about job characteristics, and new technological challenges in the workplace. For this reason, employees might feel stressed and become helpless in front of up-to-date standards and requirements. The role of collaborative, helpful, caring and sincere teammates is essential to motivate employees and increase their ability to deal with change. OCB provides free access to resources, information, community and allows participants to collectively use limited assets to achieve efficiency. These extra-role behaviors of colleagues and supervisors creates harmony within the team, inspires individuals, builds trust and boosts self-confidence to adapt to new realities (requirements, practices at workplace).

Intrinsically motivated employees tend to support the process, put in more effort and stick to corporate digital change strategy (Blumberg, Pringle, 1992; Pangastuti, Kristanti, 2021). A sense of fulfillment based on people's help and support allows followers to do more than is expected of them and influence both employees and organizational results. The author suggests that OCB will have a positive impact on employee motivation and therefore commitment to change during digital transformation.

3.5. Leader Member Exchange (LMX)

Leader Member Exchange theory describes the relationship between managers and individuals (Uhl-Bien, 1995; Liden, 1997; Graen, 1980; Scandura, 1987). Leaders treat their followers differently and their behaviors depend on how much influence, autonomy, and benefits they receive from their superiors. Positive relationships create a huge value and competitiveness for an organization. Stewart (2007) defined the Leader Member Exchange (LMX) as “an emotional support and exchange of valued resources between the leader and members” (p.532). Employees, possessing a strong exchange base with their leaders, have access to information, continuous feedback, technical support, guidance and encouragement (Sparrowe & Liden, 1997; Wayne et al., 1997). Leader-follower relationships play an important role in determining organizational outcomes. As strong manager-subordinate interactions add value into the work process, boost motivation and develop employee commitment (Wayne, 1997; Le Blanc, 2006).

Personal traits, behaviors of a leader and follower are the main antecedents of LMX. High quality LMX is associated with positive work attitudes (OCB), satisfaction, motivation, commitment and performance. Therefore, followers with positive LMX are more engaged and show a more positive attitude than those with poor quality LMX. The leader-follower relationships are very influential during times of change as well and are expected to influence employee and organizational performance (Le Blanc, 2006).

According to Harden et al (2020), social exchange factors influence the behavior and adaptation of employees. More precisely, the leader-member exchange supports the individual's ability to deal with change, reduces the negative impact of transformation and its influences on motivation, commitment, trust, OCB and employee turnover (Harris, 2009; Eisenberger, 2001, Aryee, 2002, Gerstner, 1997; Liu, 2020). High quality LMX is described with best levels of trust, respect and support between leaders and followers (Cummings, 1989; Caldwell, 2004; Maslyn, 1998). Employees with good relationships with their managers, communicate frequently and receive up-to-date information which improves confidence, reduces stress and manages the change process (Thomas and Lankau, 2009; Van Dyne et

al.,2002). Overall, LMX will positively impact employee intrinsic motivation, their ability to deal with change, and affective commitment. (Harden, Ford, Pattie, Lanier, 2020).

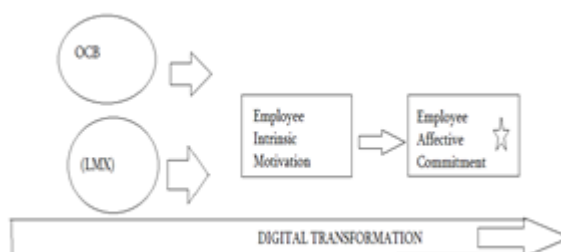


Fig.1: Conceptual model compiled from literature review

Figure 1.1. depicts the relationship between employee intrinsic motivation and employee affective commitment to achieve the efficient implementation of digital transformation and change management within the organizations. Two key factors affecting the degree of motivation towards the digitalization have been identified as OCB and LMX. LMX set the foundation for efficient change management and is a composite of available knowledge, past experiences and a clear communication. LMX has identified in the literature review motivates the employees through strengthened relationships between the leadership and the employees which turns into commitment to long term change management strategies and digital transformation processes. OCB builds upon the motivation through improved team dynamics, improved understanding of norms and empathy within the company context.

3.6. Research Limitations

Given the importance of the impact of digital transformation on employees, further research is needed to explore the social context. Organizations are trying to achieve effective digital strategy integration at the cost of little resistance to change. Employees with a transformed mindset will be more engaged and will show positive results. Assuming that transformation will be a long-term process, future research is needed to explore the impact of employee satisfaction and motivation on employee performance once digital integration is completed.

3.7. Other Recommendations

Given the importance of the impact of digital transformation on employees, further research is needed to explore the social context. Organizations are trying to achieve effective digital strategy integration at the cost of little resistance to change. Employees with a transformed mindset will be more engaged and will show positive results. Assuming that transformation will be a long-term process, future research is needed to explore the impact of employee satisfaction and motivation on employee performance once digital integration is completed.

4. Future Research

The present paper utilizes literature review to provide an understanding of potential relationships between variables. The model concluded from the current research can be replicable to further the exploration of the issue of employee intrinsic motivation and affective commitment in different types of organizations and sectors. The concepts of change,

individual intrinsic motivation and affective employee commitment are ingrained issues in private, public and other types of institutions. The findings serve to provide another perspective to both academic and business realms, that are studying motivation and commitment during the transformation. Consulting and training companies can apply the results in practice, at organizational contexts, especially during the stage of digitization initiation and implementation. Moreover, the study could be a fundamental base for the organizations planning to implement digital transformation.

5. Conclusion

Digital change requires the participation of all employees at the individual, team and managerial levels. Intrinsic Motivation is an influential factor pushing leaders and subordinates to achieve the desired organizational outcomes. The leader's motivation influences the followers' motivation during the times of change. Strong LMX opens up opportunities for efficient use of resources, communication and information sharing. Thus, positive relationships between leaders and members build trust and make employees believe in good results of change, ensure team harmony, encourage employees, inspire them to engage in organizational citizenship behavior and lead to increased productivity. When employees envision that digital change can bring advantage and prosperity for the organization, they become a better team member and work towards one and common goal (OCB). Consequently, antecedents of motivation (OCB and LMX) have a direct relationship with individual motivation, influencing employee commitment during the change.

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Revision of ethical policies regarding the incorporation of AI into K-12 education

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Abstract

Artificial intelligence has established itself as a valuable resource in modern day education with the many benefits it provides to educators and students whether it be providing a supplement to the curriculum for students to solidify their knowledge or assisting educators in checking for plagiarism within students' assignments. However, it seems that the harms of it may outweigh the benefits; artificial intelligence has brought forth unprecedented challenges in K-12 Classroom environments, prompting valid concerns amongst educators regarding the safety and advancement of education. These issues, which encompass data and privacy security risks, plagiarism, setbacks in curriculum, and more, need to be adequately addressed through the implementation of new ethical policies. These policies aim to foster a secure, transparent and effective learning environment by encouraging the responsible use of AI tools. However, lately these guidelines have raised questions among parents, students, and even educational professionals regarding the efficiency of these guidelines in the twenty-first century. Teachers, AIED researchers, and policymakers have been looking to tighten these policies to harmlessly incorporate artificial intelligence into education. Children can adapt to the deployment of AI in the classroom environment but it's important to also consider the disruptiveness of the application to the student's socioemotional and intellectual capabilities. Therefore, a revision of the current curriculum aligned with AI is required to repurpose these educational guidelines. Such revisions will hopefully advance the education through the cautious incorporation of AI into K-12 education with respect to pedagogy as well as the trainings of administrators and educators. This paper provides an overview of several guidelines currently in progress and discusses their potential effectiveness in addressing current pedagogical issues, while also presenting a futuristic perspective on the role of artificial intelligence in K-12 education.

Keywords: Artificial intelligence, ethical policies, K-12

The escalating crisis facing Afghan women and girls: Call for action

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Abstract

This paper examines the deteriorating humanitarian crisis and rollback of women's rights in Afghanistan since the Taliban seized control in August 2021. It provides background on the Taliban's oppressive policies and actions that have severely restricted women's freedoms, access to work and education, and participation in public life. The paper documents increased gender-based violence under Taliban rule, including forced marriage, honor killings, public floggings, and the targeting of women activists, judges and professionals with threats, arbitrary detention and violence.

It highlights the economic and humanitarian catastrophe unfolding as international aid has been suspended due to the political situation. This has resulted in a liquidity crisis, soaring unemployment, collapsed public services, and acute malnutrition emergency with over 90% of Afghans now dependent on humanitarian assistance. The paper emphasizes the disproportionate impact on women and girls due to aid cuts, food insecurity, healthcare breakdown, and Taliban gender policies banning female employment and secondary education.

The analysis traces the factors driving mass displacement within and from Afghanistan, creating one of the world's largest protracted refugee crises. It critiques inadequate asylum and resettlement quotas offered by EU states, leaving many Afghans with precarious legal status or dependent on overstretched host countries like Pakistan and Iran.

Keywords: Afghanistan, Taliban, Humanitarian crisis, Women's rights, Gender discrimination, Gender-based violence, Forced marriage, Access to education, Displacement, Resettlement, International aid, Economic crisis, Food insecurity, Policy recommendations.